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Manuel Pedro Rodríguez-Bolívar *Editor*

Measuring E-government Efficiency

The Opinions of Public Administrators and Other Stakeholders

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Editor

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Foreword

Twenty Years and Keep Going: Can e-Government Efficiency Be Questioned?

e-Government development has been traditionally based on government strategies, which have been realized by respective program and project planning and management. The overall process is being performed under the responsibility of the governments, which have specified quite similar targets for public sector's modernization: cost and time savings from public transactions; the development of an effective and efficient, friendly, and accountable public administration. Although these common targets have been updated since the first e-Government definition (i.e., open and personalized government have been introduced quite recently), public sector's effectiveness and efficiency were grounded from the beginning and are still two of the most important objectives in e-Government strategies.

According to the World Bank (2012), government effectiveness reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Findings from this World Bank report illustrate unexpectedly low values even recently in many of the examined cases. On the other hand, government efficiency concerns public sector performance or productivity rates and it is mainly associated with public spending effects to socioeconomic indicators, such as education enrolment ratios or infant mortality (Hauner and Kyobe 2008). This International Monetary Fund (IMF) study returns that the higher the public spending relative to gross domestic product (GDP), the lower the public sector's efficiency. To this end, e-Government efficiency can be considered the performance of e-Government projects or deliverables, as well as public sector's performance improvement from e-Government implementation.

The retaining of efficiency's challenge generates various questions to e-Government scholars: *Hasn't public sector achieved in becoming efficient enough in the digital era*? *What do we expect from public sector efficiency*? And *is efficiency a dynamic factor, such as "satisfaction" or "adoption," which can either evolve or decline*? To this end, this book collection questioned various scholars and professionals, and various prestigious outcomes have been delivered, which among others illustrate that:

- Efficiency is a complex factor, which affects e-Government project's success and stakeholders' expectations.
- Various efficiency measurement methods can address project and stakeholders' demands.
- Efficiency's increment improves stakeholders' relationships.

Taking into account this book's findings, it remains extremely important to realize that despite the abovementioned ambitious and heavy-funded planning, even recently less than an average of 10 % of public services are being offered online at an international level (Anthopoulos et al. 2007; World Bank 2012); European states have not achieved delivering their common 20 e-services nor cross-border public services (European Commission 2013); less than 45 % of the existing public services can be offered online, while citizens still appear reluctant against e-Government services mainly compared to e-banking services (European Commission 2013).

However, low e-service delivery and respective adoption is only one dimension of e-Government and respective government efficiency. Some other crucial findings concern bureaucracy's elimination: Bovens and Zouridis (2002) identified the *screen-level* bureaucracy as information-based decision-making routines, which enables bureaucratic procedures even in the digital era. These bureaucratic processes can definitely affect public sector efficiency and decline e-Government efforts.

Moreover, Bekkers and Homburg (2007) depict four e-Government myths, one of which addresses the expected rapid government transition to an information revolution. This myth can be related to a mistaken stakeholders' understating and, in this context, rational planning and strong management can enable quicker migration as this book's section 3 presents. However, rational planning is considered to be a second myth (Bekkers and Homburg 2007), which appears when standardization and interoperability in the public sector are not enhanced. To this end, this book's section 2 illustrates exemplars that meet these public sector's prerequisites while they enable tracking of stakeholders' needs.

All the above text documents the significant contribution of this book: public sector's efficiency and effectiveness are still far behind the expected values despite e-Government projects' implementation for more than 20 years. To this end, this book views efficiency from the lens of e-Government projects' performance, while chapters' contributors define methods to measure efficiency from this perspective. These methods can address the reasons that obstruct administration's productivity growth.

Moreover, existing myths regarding e-Government low contribution to public sector's efficiency are addressed by chapters' contributors both via meeting end users' expectations and via exemplars, which deliver important experiences to e-Government domain.

Thessaly, Greece Leonidas Anthopoulos

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Preface

In recent decades, governments around the world have been faced with rapidly growing challenges on how to make public service and administration transparent, effective, and efficient. Increasingly connected citizens and stakeholders are demanding that governments be more transparent and deliver services more rapidly and efficiently. The implementation of the Information and Communication Technologies (ICT) in public administrations, which has been called widely as "e-Government," has become a central part of the process of the modernization of public administration, allowing a strategic and intensive use of ICT, both in the internal relations of public administrations and in terms of the relationship with citizens and with companies in the private sector.

Although there is a large amount of research on e-Government, these studies have sought to highlight the possibilities of e-Government implementations and to show different experiences about e-Government projects. Nonetheless, these e-Government implementations are usually not justified from an efficient analysis point of view by both governments and researchers, and it is difficult to know if these implementations are meeting stakeholders' demands regarding information transparency, rendering of online public services, or citizens' participation in public sector management.

The edited volume *Measuring e-Government Efficiency. The Opinions of Public Administrators and Other Stakeholders* enhances our understanding of how e-Government implementations are impacting on the efficiency of government in improving their transparency and in providing public services. By focusing on e-Government efficiency, this edited volume fills the knowledge gap in the efficiency of e-Government projects, analyzing if public managers, policy-makers, and other stakeholders think that e-Government policies have improved their management and decision-making process through the engagement of the citizenry or else they are only a procedural improvement through the introduction of new ways of delivering public services or disclosing public sector information.

Through a rigorous peer review process that focused on relevance, quality, and extent of contribution to the theme of the book, this edited volume presents excellent research on how to measure e-Government efficiency and how public managers and other stakeholders perceive the usefulness of e-Government projects in improving efficiency in public administrations. This book includes 13 chapters from leading e-Government scholars and experts from around the world and is a convenient source of information on what governments are doing in terms of their e-Government initiatives and provides the most up-to-date information on important developments regarding e-Government around the world and its effects on the meeting of stakeholders' needs and on the work of public managers/politicians.

This is a very interesting and relevant issue for those who are interested in understanding e-Government development as a worldwide phenomenon. Therefore, I believe that the book will be found useful for both academicians and practitioners. On one hand, it will strive to include theoretical perspectives and, therefore, to carry on further academic research. On the other, it will come across with some strategic proposals that will allow to move forward and to address future challenges.

This book would not be possible without the tireless work of the authors and the helpful comments of reviewers. The review process was carefully undertaken and papers were evaluated in three different times to ensure a high quality of their contributions. Therefore, the editor thanks the reviewers for their invaluable service in making this project a success.

Granada, Spain Manuel Pedro Rodríguez-Bolívar

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Chapter 1
The Need for Analyzing e-Government Efficiency: An Introduction

Manuel Pedro Rodríguez-Bolívar

Abstract The question of e-Government has become one of the most important issues on political agendas today, and since the late 1990s, a number of countries have launched e-Government projects, with a particular emphasis on using ICT to provide electronic information and services to citizens and businesses. An analysis of literature review indicates that e-Government research has been focused on topics such as enhanced services, streamlined transactions, two-way communication, and greater transparency, but theoretical analysis and practical experiences regarding systems to measure impacts of e-Government implementation on the efficiency of public administrations remain without an appropriated answer nowadays. Therefore, there is a need for analyzing efficiency of e-Government implementations and for knowing the perception of main factors involved in e-Government projects regarding effects of e-Government projects into the efficiency of their work and decision-making processes.

This book, structured into three parts, seeks to contribute to the literature by filling the existing void and expanding knowledge in the field of efficiency of e-Government implementations for both public administrations and stakeholders. It provides understanding how e-Government efficiency could be measured and about the reasons why public managers and politicians are undertaking e-Government projects, as well as why stakeholders could be forcing public administrations in order to undertake e-Government projects.

1.1 Introduction

Increasingly connected citizens and stakeholders are demanding that governments be more transparent and deliver services more rapidly and efficiently. Ready access to information of public value, increased transparency in government operations,

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and a greater willingness to listen to citizens and secure their involvement are pivotal requirements for efficient, open, and responsive government.

In recent decades, governments around the world have been faced with rapidly growing challenges on how to make public service and administration transparent, effective, and efficient. Based on Coase (1937, 1960), Ciborra (2005) indicates that the implementation of the information and communication technologies (ICT) affects the type and effectiveness of governance structures in different conditions and consequently affects economic efficiency and the social costs of coordination. This implementation has helped meeting citizenry needs, enabling greater accessibility to public information and services (Martins 1995), together with greater interaction and individual participation in public management (Dunleavy et al. 2006; Taylor et al. 2007) and greater information transparency (Rodríguez et al. 2010).

In this context, the question of e-Government has become one of the most important issues on political agendas today, and since the late 1990s, a number of countries have launched e-Government projects, with a particular emphasis on using ICT to provide electronic information and services to citizens and businesses, combining the aims of increasing efficiency and becoming more customer responsive (Chen and Gant 2001).

These e-Government projects have been applied to ordering at least three kinds of processes (Ciborra 2005). First, it attends to the relationship between the administration and the citizen and the related re-engineering of the activities internal to the administration (Bellamy and Taylor 1998). A second level regards the way in which the boundaries between the state and the market are redrawn, by the creation of an electronic, minimal state, more transparent, agile and accountable (Heeks 1999). And finally, a third level deals with the purpose of aid policies aimed at introducing e-Government into developing countries, because it is thought that better accountability and improved transparency are the characteristics of good governance (United Nations Development Programme 2001).

This interest for implementing e-Government projects into governments has made scholars to undertake a bulk of research on e-Government topics in diverse academic disciplines and journals, including articles analyzing the relationship between ICTs and the organizational and institutional change in governments (Dunleavy et al. 2006), analyzing the evaluation of public policies (Coursey and Norris 2008), examining the benefits of e-participation (Edelenbos et al. 2009), studying the improved efficient delivery of public services (Caiden and Sundaram 2004), improving transparency and accountability (Piotrowski and Van Ryzin 2007; Rodríguez Bolívar et al. 2007), as well as improving interoperability (Landsbergen and Wolken 2001). In sum, these studies have mainly sought to highlight the possibilities of e-Government implementations and to show different experiences about e-Government projects (Yildiz 2007).

Because of the dramatic growth in e-Government projects and in e-Government research, a critical integrative review of research in e-Government could be useful in order to provide a broad view of the current state of e-Government research with the aim at locating the need for efficiency analysis into e-Government field of knowledge. In this regard, the next section of this chapter makes an overview of literature reviews about e-Government that have been undertaken in the last years into the field of e-Government.

1.2 A Panoramic View of e-Government Research

A literature review is told to provide an excellent overview of the current state of the art and thus enable a profound analysis of the contribution and methodologies used in that particular research field (Rodríguez Bolívar et al. 2010). A bibliometric study of e-Government research published in ISI-listed journals has indicated that the presence of e-Government research is still scarce, with the articles published in this field only making up 2.75 % of all published articles, and the majority of these are in the field of Information Science and Library Science and are mainly published in a selective number of journals, concretely, in Government Information Quarterly, Public Administration Review, and American Review of Public Administration (Rodríguez Bolívar et al. 2010).

Nonetheless, there is a gradual increase in the research carried out in the field of e-Government over the last few years, especially regarding technological innovation and modernization in the management of public administration, e-Government program/project evaluation and policy analysis, deliberative democracy, and accountability, transparency, and dissemination of information (Rodríguez Bolívar et al. 2010). Indeed, the main research themes have been focused on these topics reflecting a transformation of management systems within public administrations, enabling enhanced services, streamlined transactions, two-way communication, as well as greater transparency in the management of public organizations and the disclosure of a greater volume of information on governmental websites due to the importance attached by governments to promoting e-democracy and to reducing political corruption (Shim and Eom 2009; Kim et al. 2009).

In the last years, there is a lively debate about the transformation in the delivering of public sector services (Osborne 2009, 2010) and the impact of technology impact of e-Government applications. In this regard, Heeks and Bailur (2007) conducted a research on the three selected sources were those identified as the leading e-Government-specific research outlets during the initial years of the twenty-first century are the following: the journals *Information Polity* (2002–2004) and *Government Information Quarterly* (2001–2005) and the conference proceedings for the *European Conference on e-Government* (2001–2005).

The analysis on e-Government performed by these authors regarding on technology impacts and impact causes suggests that almost all of the analyzed papers take a position that is more positive and more technologically determinist (Heeks and Bailur 2007). It seems to regard ICTs as a "good thing" for government, ignoring the evidence about downsides to technology and ignoring the evidence of the widespread costs of failure of e-Government. It could be explained because of the new authors that seem to be more optimists to e-Government implementation, on one hand, and the direct interest of the authors in showing e-Government projects as positivist because they had direct roles in the e-Government projects or services, on the other hand (Heeks and Bailur 2007).

In any case, a lack of theory regarding systems to measure impacts of e-Government implementation on the efficiency of public administrations remains without an

appropriated answer in the literature review. In this milieu, Heeks and Bailur (2007) concluded that the lack of engagement with theory can be explained by a focus on practice, and practical recommendations, which has been traditional in e-Government research (Heeks and Bailur 2007; Rodríguez Bolívar et al. 2010).

Therefore, because of the dramatic growth in the implementation and research on e-Government projects, in this book, we propose to pause and reflect on the efficiency analysis of e-Government projects to draw conclusions from that reflection about the ways to measure e-Government efficiency, experiences in e-Government efficiency, and possible future directions for e-Government research in this area.

1.3 e-Government Efficiency: An Unsolved Problem

As noted previously, recent interest in e-Government has been reflected in the large amount of research studies and projects reported in diverse academic disciplines and journals, highlighting the possibilities of e-Government implementations and showing different experiences about e-Government projects, convinced that ICT improves technical efficiency and accelerates productivity growth (Sung 2007; Thompson and Garbacz 2007).

Nonetheless, these e-Government implementations are usually not justified from an efficient analysis point of view by both governments and researchers, and it is difficult to know if these implementations are meeting stakeholders' demands regarding information transparency, rendering of online public services, or citizens' participation in public sector management. Also, it is difficult to assess the social and political impacts of e-Government systems. Indeed, many papers focused in describing different experiences about e-Government projects have demonstrated that not all e-Government projects have been successful implementations (Heeks 2002; Dada 2006).

Therefore, there is a need for analyzing the way of measuring efficiency of e-Government implementations and the perception of main factors involved in e-Government projects regarding effects of e-Government projects into the efficiency of their work and decision-making processes. Under this scenario, this book seeks to make a critical view of e-Government developments from the perception point of view of stakeholders about e-Government projects and their effects. It explores if e-Government applications are introduced as a fad or they are introduced according to real demands from the citizenry.

To achieve this aim, the book is structured into three parts. The first one is addressed to analyze the measurement of e-Government efficiency from a theoretical point of view. The second part of the book seeks to analyze studies on perception of politicians and public managers on e-Government developments regarding e-Government projects and their impact on the improvement of government efficiency and the interaction with stakeholders, in particular, on the efficiency in the rendering of public services, in the legitimacy of the actions taken by public administrations, or in the information transparency. Finally, the third part of the book

examines studies on perception of stakeholders like citizenry, providers, and other stakeholders in e-Government developments regarding the improvement of public sector services, participation, or information transparency.

In this context, the first part of the book, composed by four chapters, focuses on understanding how e-Government efficiency could be measured. The first chapter, written by José-Rodrigo, put emphasis on the questions about the purposes and contributions of e-Government to societal improvement, which have been excluded from evaluation. With these insights and using systems thinking as a body of knowledge, three conceptual patterns of practice are defined to help stakeholders engage with evaluation activities and positively improve the influence of e-Government in society. On the other hand, Sanja Bogdanović-Dinić, NatašaVeljković, and Leonid Stoimenov, taking into account the growing open data initiatives in governments, present and apply a model for assessing data openness, which relies on eight open data principles established by the Open Government Working Group. Thomas Zefferer, Vesna Krnjic, Klaus Stranacher, and Bernd Zwattendorfer analyze usability and security issues as main requirements for efficient e-Government services and applications. And finally, Lasse Berntzen discusses efficiency of e-Government services both from the user perspective and the administration perspective. Therefore, this last chapter introduces the other two parts of the book.

The second part of the book includes four chapters that examine case studies on the perceptions of both public sector officials and politicians to know the efficiency of e-Government projects in order to improving the work into public administrations and to improving the relationship with stakeholders. Mark Liptrott discusses broad lessons from the UK pilot program of e-voting that resonate through the years with the potential to influence the voluntary adoption of e-Government policies. The discussion includes looking beyond the traditional role of evaluation to identify influences on policy adoption decision making. Gabriel Purón-Cid conducts a confirmatory factor analysis to uncover the multiple dimensions of e-Government efficiency from the perspective of implementers inside of government. On the other hand, Laura Alcaide-Muñoz, Carmen Caba-Pérez, and Antonio M. López-Hernández examine public managers' perceptions of e-Government efficiency, determined by means of a survey in this respect addressed to public managers in municipal governments in Andalusia. Finally, taking into account the possibilities of social media to communicate with citizens, Dennis de Kool analyzes the challenges, risks, and dilemmas of social media for Dutch civil servants.

Finally, the third part of the book includes five chapters that provide data on the perception of stakeholders like citizens and providers about e-Government developments. In addition, studies on a multistakeholders perspective are also included. In this regard, Tommi Inkinen and Maria Merisalo analyze stakeholder view on e-Government from the public sector management applying target group interviews from 15 representatives working on the "Electronic Services and Democracy" (SADe) program. Mark Deakin, Fiona Campbell, and Alasdair Reid explore the governance of the ICT-related developments responsible for transforming Manchester into a "digital powerhouse" and challenges the City's recently announced "Next Generation Digital Strategy." Ignacio Criado and David F. Barrero

analyze the demand side of e-Government in Spain profiling the features of the users of e-Government in Spain and the variables explaining their use of e-Government services. Gökhan İskender and Sevgi Özkan Yıldırım undertake a multidimensional quantitative study focusing on the opinions of external and internal stakeholders on the probable success factors that are assumed to be effective on the e-Government transformation success in Turkey. And finally, Sonia Royo, Ana Yetano, and Basilio Acerete analyze whether citizens are familiar with e-participation tools, what citizens and organizers think about the effectiveness of citizen participation, and, finally, whether there is a perceived effectiveness gap between online and offline (traditional) forms of participation.

Therefore, this book is a convenient source of information on important developments regarding e-Government around the world and its effects on the meeting of stakeholders' needs and on the work of public managers/politicians. In this regard, it contributes to the literature by filling the existing void and expanding knowledge in the field of the accomplishment of expectations about e-Government applications for both public administrations and stakeholders. It provides understanding how e-Government efficiency could be measured and about the reasons why public managers and politicians are undertaking e-Government projects, as well as why stakeholders could be forcing public administrations in order to undertake e-Government projects. Therefore, this book could be of interest to both academics and policy-makers.

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Chapter 2
Systemic Patterns of Practice to Improve e-Government Evaluation

José-Rodrigo Córdoba

Abstract e-Government is now a worldwide and complex phenomenon. A dominant view of how it should be evaluated focuses on assessing both e-Government evolution and use. Questions about the purposes and contributions of e-Government to societal improvement are being excluded from the evaluation. In this chapter a case study of Colombia is used to gain insights into the challenges faced by evaluators. With these insights and using systems thinking as a body of knowledge, three (3) conceptual patterns of practice are defined to help stakeholders engage with evaluation activities and positively improve the influence of e-Government in society.

2.1 Introduction

The phenomenon of e-Government (electronic government) spreads rapidly and worldwide. Whilst for many governments the primary focus of e-Government is to achieve efficiency in terms of economies of scale and communication, they find it difficult to assess the social and political impacts of e-Government systems. This chapter argues that this difficulty lies partly in the use of traditional models for e-Government (ex post) evaluation (measurement). Such models make the assumption that in order to achieve efficiency, different stages of *evolution* and *diffusion* of e-Government have to be completed first. Softer aspects and alternative views of efficiency as perceived by stakeholders are being excluded from evaluation. With such a narrow focus, e-Government could be contributing to transform the public sphere of societies into an exclusive electronic market of products and services for those who can afford them and thus converting citizens into passive consumers

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(Ciborra 2005; Mattelart 2003). A key question therefore that this chapter addresses is: How can e-Government evaluation be more comprehensive and inclusive?

This chapter proposes a number of *conceptual patterns* to enhance critical reflection in e-Government evaluation from the perspective of different stakeholders. The word pattern is used here to exemplify an ideal situation in which different stakeholders jointly evaluate and act on the implementation of e-Government systems. The definition of patterns is inspired in the ideas of applied systems thinking (Jackson 2003; Midgley 2000) and more concretely in a programme of research to support information systems activities with systems thinking ideas and methodologies (Córdoba 2009).

Although the proposed patterns are conceptual in nature, their definition draws on insights from a case study of an e-Government evaluation approach that is currently used by the government of Colombia (GovLinea 2009; Rodriguez and Cusba 2011). Colombia is regarded as a best practice case of e-Government in South America (Parra 2011) and elsewhere (Ndou 2004). The case study involved a review of relevant policy documents, evaluation reports and three interviews with members of the Colombian e-Government programme (technical director and two people responsible for evaluation). The idea was to elicit some key challenges which could then be interpreted in the light of relevant theory and suggest future improvements for practice (Walsham 1995). From the insights of the case study and using systems thinking as a conceptual lens, the proposed patterns can enable e-Government users, administrators and technology experts work together to improve evaluation practice and the contributions of e-Government to societal improvements.

The chapter is organised as follows: A context for e-Government is set with a view of it as a complex phenomenon and in need of enriching its evaluation. Key challenges for e-Government evaluation are identified through the case study of Colombia. With systems thinking as a conceptual lens, three (3) patterns to improve evaluation are proposed to address these challenges. Some implications for e-Government evaluation practice and policy are drawn in the concluding section.

2.2 e-Government and Its Evaluation

There is no single or agreed definition of the phenomenon of e-Government. Instead, there are several definitions to account for different manifestations of this phenomenon (Heeks and Bailur 2007; Henman 2010; Marche and McNiven 2003; United Nations 2010). To some people, e-Government involves the use of information and communication technologies in public administration. To others, it is the use of systems and technologies to transform relationships between government organisations and citizens, including electing and communicating with government representatives. The different manifestations of e-Government include e-procurement, e-marketing, e-management, e-service provision and e-democracy (Henman 2010). In all these manifestations, e-Government is conceived of as a vehicle to enable countries to *move* from a purely operational or transactional nature towards states of governance, where transparency, public accountability and participation become

attributes or measures of such governance (Calista and Melitsky 2007; Marche and McNiven 2003).

The variety of definitions and scope attributed to e-Government and at different government levels (local, regional or national) reinforce the view that this phenomenon is complex and therefore difficult to evaluate (Irani et al. 2008). An early paper by Gupta and Jana (2003) suggests that the degree of complexity of e-Government evaluation arises due to the different dimensions or aspects that governments want to evaluate. These could be economic, political or social (Chircu 2008) in order to account for a variety of benefits and costs. In addition, gathering relevant data for evaluation according to Gupta and Jana requires the use of different estimation methods and techniques: 'Hard' ones can be used to quantify costs and benefits, whereas 'soft' ones aim to gather ideas about values and impacts of e-Government systems from the perspective of users and those individuals managing or operating them (Gupta and Jana 2003).

Despite a declared degree of complexity in e-Government and a number of evaluation approaches being available from the information systems literature (Farbey et al. 1999; Irani and Love 2001), what seems to predominate in practice is the use of one or two types of evaluation models. These are *evolution based and service quality based*.

Evolution-based models of evaluation aim to assess the degree of implementation achieved in the different stages of e-Government evolution. Models assume that e-Government evolves through stages of information, interaction, transaction, integration (vertical and horizontal), transformation and ultimately a stage of e-Governance (Andersen and Henriksen 2006; Layne and Lee 2001). Government organisations and those individuals who are responsible for implementing e-Government services should assess their progress in implementing services and thus moving from one stage to another. The outcome of evaluation is a summative assessment of the degree of completion of e-Government plans and projects together with a cost/benefit analysis at each stage. Aspects that are assessed include financial (cost avoidance, cost efficiencies, increase in service levels or quality), social (dissemination of information, public value creation, improved resource allocation) and political (enablement of democracy, transparency, accountability, social justice or liberty) (Chircu 2008; Grimsley and Meehan 2007; Papadomichelaki and Mentzas 2012). Although the opinion of citizens is an essential input for this type of evaluation models, the focus is on determining the degree of progress in achieving government goals.

Service-quality-based models gauge the users' degree of satisfaction with services and their current or future intention to use them (Alshawi and Alalwany 2009; Connolly et al. 2010; Papadomichelaki and Mentzas 2012; Verdegem and Verleye 2009). Focus of evaluation is on identifying features of e-Government systems as presented through websites, portals and other channels which work or which do not work for users. Evaluation models consist of a series of variables that are related in cause-effect (hypothesis) form so that users' intention of e-Government service use is the by product of different aspects including service friendliness, ease of use of systems, speed and security of transactions, protection of personal information and degree of control over the service (Gilbert et al. 2004; Grimsley and Meehan 2007). The outcome of evaluation is an identification of these or other aspects (technical, procedural and organisational) which need attention in order to improve satisfaction and hence increased e-Government service use.

Underpinning the above two types of evaluation of e-Government, there are unquestioned assumptions: (1) Efficiency in e-Government is about achieving economies of scale by streamlining government activities which in turn will make communications between governments and their constituencies faster, friendly, reliable and cost effective and (2) all e-Government stakeholders agree with this view on efficiency because it is deemed as 'citizen centred' (in other words it is assumed that this is what citizens want) (Holmes 2001).

Both of these assumptions contribute to generate a limiting and passive attitude of stakeholders towards e-Government, that of being mere consumers of services. These assumptions need to be challenged in e-Government evaluation by enabling stakeholders to express their concerns so that they can also define how information systems and technologies can contribute to improve their quality of life in society (Córdoba 2009).

These assumptions have been considered before in the literature. Although examples of participative stakeholder-oriented evaluation have been proposed in the literature of information systems (Remenyi and Sherwood-Smith 1999; Walsham 1999) and e-Government (Grimsley and Meehan 2007; Irani et al. 2008), the resulting evaluation approaches seem to subordinate evaluation to successful e-Government implementation and thus to economic efficiency. Furthermore, little is provided in the form of practical tools to evaluation stakeholders so they can do the evaluation themselves. This chapter aims to contribute to address these shortcomings by drawing on the insights obtained from a case study on e-Government evaluation in Colombia and using systems thinking to conceptualise practical ways to improve evaluation practice. In the next section, the case study is presented.

2.3 A Case Study: Colombia's e-Government Evaluation Model

In the practice of e-Government evaluation, many governments use a combination of both of the models presented above (Gupta and Jana 2003), and they also incorporate project management techniques to assess and act on the degree of completion of their plans. What follows is a brief presentation of a case study of an e-Government evaluation programme in Colombia, a country which has been regarded as best practice in South America given the growth in the number of e-Government services being provided in the last few years and the rankings obtained in the United Nations index of e-Government (Parra 2011). The case presented involved review of key policy documents (ColombiaDigital 2006; GovLinea 2009; Mincomunicaciones 2007; Vision-2019 2005), evaluation reports (GovLinea 2011) and interviews with the technical director and evaluators of the programme in the period between 2007 and 2011 (Rodriguez and Cusba 2011; Sin 2007). Permission was granted to use material from interviews and documents.

To date, the Colombian government has developed an evaluation model that aims to assess progress in the achievement of different objectives related to *both* the implementation of electronic government services *and* their use by citizens and

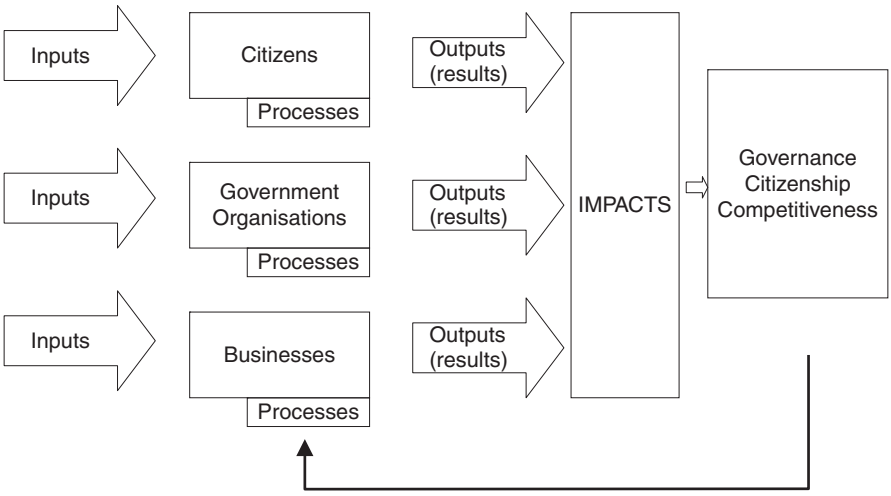

Fig. 2.1 Colombian e-Government evaluation model (GovLinea 2009)

businesses (GovLinea 2009; Rodriguez and Cusba 2011). As seen in the figure below, the model gathers data to assess progress in three (3) main areas: governance, citizenship and competitiveness. Governance refers to efficiency in the delivery of e-Government services in seamless, comprehensive and transparent ways. Citizenship relates to the enabling of dialogue, democratic decision-making and accountability through the use and delivery of such services. Competitiveness means an increase in productivity and opportunities for growth for both government organisations and businesses via e-Government services (GovLinea 2009; Rodriguez and Cusba 2011) (Fig. 2.1).

There are three main user groups involved in e-Government evaluation, *citizens*, *businesses and government organisations*, for which evaluation has a number of **components**: inputs, processes, outputs and impacts. As the figure above shows, processes require certain **inputs** to run and will generate certain **outputs or results** which in turn can be used to assess different **impacts** (including benefits) of e-Government in governance, citizenship and competitiveness.

Each of the components of the model (inputs, processes, outputs and impacts) has associated a number of **attributes** (adjectives) and **aspects** which in turn have **indicators**. Indicators are measured via **variables** for which data (quantitative, qualitative) is collected from the main user groups. For government organisations, data is collected via questionnaires from interviews and by also examining each organisation's website or portal. For both citizens and businesses, data for variables is collected in the form of questionnaires[1].

[1] According to Colombian e-Government evaluators, for businesses two evaluation interviews are conducted: one with the legal representative and another with the person in charge of using an e-Government service.

The results of the model are calculations performed in the data from variables and grouped according to each of the model's components. Results obtained between 2008 and 2011 (GovLinea 2011) indicate that overall, many government organisations are reasonably on target to implement their e-Government services and meet most of the expected transformation stages expected (publication, transaction, interaction) although an initial goal was to have 100 % of e-Government services implemented by 2010 (GovLinea 2009). Results show that citizens and businesses perceive that e-Government services offer them up-to-date and accurate information in a very friendly way and that there are important savings in cost and time being obtained (GovLinea 2011). Evaluation reports recommend government institutions at different levels (national, regional, local) to continue working to make their internal processes to become more interoperable, transparent and efficient.

2.3.1 Challenges to Improve Evaluation

The above model combines elements of evolution and service quality types of evaluation. On the one hand, it enables the Colombian government to have an overall view of how e-Government plans are progressing in each government organisation. On the other, it gathers citizens and government officers' perceptions about their satisfaction with the e-Government services provided. However, there is still room for improvement. The following challenges were identified when interviewing Colombian evaluators (people responsible for administering the evaluation) and asking them about their future plans (Rodriguez and Cusba 2011; Rodriguez 2011, 2012). In this section these challenges are highlighted and related to the broader literature on e-Government and its evaluation.

First, there is a challenge to quantify different types of data to feed into the evaluation model. As e-Government evaluators in Colombia say,

> We can talk about governability, governance…do I trust more in the government, do we trust more in my institutions?…the other terms [competitiveness, efficiency] could be easier to define…the difficulty is to gather information [evaluation], the baseline, then do the follow up…so far we have got good results, but now we want to transit from perception to [hard] data, so that in the medium term we can measure the real impact of e-Government… from all groups' perspectives [citizens, businesses, government organizations]…from the offer and the demand sides of e-Government. (brackets added) (excerpt from interview) (Rodriguez and Cusba 2011)

For Gupta and Jana (2003), there are many aspects for which quantitative e-Government information is not available, and therefore they are excluded from evaluation. A degree of subjectivity is inevitable when it has to be decided by someone in government *what* impacts are to be measured and *how* these relate to perceived benefits by e-Government users (including government organisations themselves). Subjectivity is also reflected when users of e-Government have to 'rate' their satisfaction with the provision of e-Government services.

A second challenge arises when government organisations intend to use the results of evaluation models to influence future decision-making and action. It becomes difficult to know why exactly e-Government has delivered a particular benefit or impact, and therefore it is not easy to decide where action needs to be taken or rewarded in government (Gupta and Jana 2003, p 369). Excessive concern with performance measurement can leave little room to the *management* of such performance (Northcott and Taulapapa 2012). According to Colombian evaluators,

> To date, we have not been fully judicious in feeding back [evaluation results] to [all] actors…we simply upload the results…we do not often provide feedback neither do we sit with organizations because we do not have the capacity to sit with all [government] organizations and encourage them to evaluate themselves. (brackets added) (excerpt from interview) (Rodriguez and Cusba 2011)

In order to address the above challenges, this chapter proposes that e-Government evaluation should be considered a system that is part of a wider system (Ackoff 1981) and whose activities will also have implications for and will be affected by other domains of activity within government and beyond. With this consideration in mind, there is the possibility for stakeholders to co-define what they want from e-Government, how they consider best to achieve e-Government efficiency and how to evaluate it. By using systems thinking as a conceptual lens, several possibilities to improve evaluation can be developed which include:

- e-Government can be considered a socio-technical system so that different perspectives of stakeholders can be elicited and considered in systems design and maintenance (Olphert and Damoradan 2007).
- Evaluation processes can then support the search for different purposes attributed to e-Government by those designing, managing or using e-Government services (Checkland and Poulter 2006).
- Purposes and ways to evaluate efficiency can be continuously defined and revisited with a view to consider what really works and why (Chapman 2002). This includes discussions about what counts as evaluation data as well as how data is to be collected (Midgley 2000).

To take these possibilities forward, the ideas of Córdoba on patterns of systems practice are explored now (Córdoba 2009). According to Córdoba, a *pattern* reflects a commonly accepted way of working by different stakeholders in the pursuit of societal improvements. He defines three patterns to capture ways of using systems ideas and methodologies in dealing with complex information systems problems. With patterns, those people in charge of planning or evaluating information systems can decide what is relevant to address in a particular situation and employ systems thinking ideas accordingly.

Patterns described are ideal scenarios of dialogue and participation of stakeholders. Under each of the patterns proposed, there are specific activities involving critical reflection as well as systems methodology use as follows:

- The first and most common pattern is an *idealist* one. Within this pattern people focus on generating or adopting a *transformative vision* of a future organisation

or a situation and define the role of information systems and technologies to implement the vision. The use of systems thinking and methodologies within this pattern consists of enabling stakeholders to define a vision or to make it operational to their level of work in the form of concrete action plans as well as mechanisms to evaluate progress in making the vision happen or to review it.

- A second pattern of systems practice is called *strategic*. This pattern highlights a focus on *shaping* the use of systems and technologies according to people's values, concerns and aspirations. Engagement, participation, dialogue and debate are key activities. Systems methodology use aims to support interactive design of actions for improvement of a situation and their continuous evaluation through the provision of information.
- A third pattern considers that the use of systems and technologies in organisations and society has a degree of unpredictability; therefore, people can use them for their own ethical purposes. Ethical reflection should be about *who we want to become* in the light of constraints and possibilities generated by power relations and *how we can use* available systems and technologies to become those *who we want to become* as individuals or groups.

The choice of a dominant pattern to follow obeys what is relevant as well as what is feasible to do in a situation. In some cases there might be willingness and commitment from stakeholders to generate transformative visions or a perceived need to firm up a vision under which a radical use of systems and technologies should be achieved. In other cases and once organisations have some information systems plans in place, it might be more feasible to facilitate dialogue and exploration. Or in other cases the situation appears to be complex, with many conflicts of interest at hand as well as divergent perspectives on what should be done. In this case both formal and informal types of evaluation should be supported.

Using the above ideas on systems thinking and patterns of practice, the chapter now proceeds to propose three evaluation patterns which could then help people involved and affected by e-Government evaluation improve their evaluation activities. The aim is not to replace but rather complement the use of existing evaluation models by facilitating participation and critical reflection for the benefit of e-Government stakeholders and societies in general.

2.4 Idealist Pattern for e-Government Evaluation

Under this pattern, the aim of evaluation is to define a vision of how e-Government is to improve life in society for individuals. The achievement of a vision requires meeting a number of preconditions in terms of the technological infrastructure that is needed to provide e-Government services. These preconditions are to be validated in relation to their feasibility as well as to how they contribute to generate a supporting operational environment to advance towards the desired vision.

What this pattern suggests is a continuous and comprehensive planning and review of e-Government so that its evaluation becomes an integrated effort to its development. In other words, evaluation is the overall feedback component of the

e-Government system (Irani et al. 2008). This also means that there is continuous and participative learning about e-Government and its desired impacts within and beyond government organisations. Learning to see what works and what does not becomes essential.

The pattern offers evaluation stakeholders an opportunity to 'start from scratch' and define the vision of an ideal system of e-Government *within* an ideal system of society. A future society should cater for the needs and concerns of present and new generations. In such a society, existing problems of the present time are not only solved or resolved but dissolved (Ackoff 1981).

Under this pattern evaluation stakeholders can then define or review the purposes attributed to e-Government systems and how the intended efficiencies serve societal improvements in a future society. In this way they can also redefine the purpose and activities of evaluation so that existing evaluation models can be reviewed. The following questions could help evaluators and other stakeholders engage in creative thinking about e-Government and its evaluation:

2.4.1 General Questions to Formulate a Vision

- What sort of society do we want in the future? How does this vision meet the needs and aspirations of different stakeholders?
- What transformations are required to move forward? Are these transformations desirable?
- What e-Government infrastructure and services are to be provided to achieve desired transformations?

2.4.2 Specific Questions to (Re)define the Evaluation of e-Government

- How can progress to implement the stated vision and transformations be monitored in terms of objectives or critical success factors? What indicators are needed?
- What data is required for their evaluation? How can this data be obtained from existing evaluation models?
- How can the vision be refined or modified periodically? Who should be involved?

The set of evaluation indicators to assess progress towards achieving the stated vision can also be designed as part of a 'viable system' in terms of the information that it can provide to different government managerial levels to help them deal with complexity at each level (Beer 1985). In each level, the evaluation system would contribute to assess the achievement of that level's purpose in relation to a vision by providing information and opportunities for communication with that level's environment (local, regional, national) (Espinosa and Maimani 2010).

2.5 Strategic Pattern for e-Government Evaluation

In cases where 'free thinking' to formulate a desired vision of society and e-Government cannot take place or is difficult to be achieved, an alternative and complementary pattern of practice would focus on learning about how people can make best use of existing e-Government services. This pattern privileges an interpretive evaluation type of evaluation in which different concerns, issues and claims about provision of services can be surfaced or raised by stakeholders (Guba and Lincoln 1989).

A strategic pattern facilitates dialogue and mutual understanding. There could be a variety of purposes attributed to e-Government by stakeholders. Therefore, it becomes necessary to enable stakeholders to elicit their perceptions about the role(s) that e-Government and its services are currently playing to address their own concerns, values and aspirations. In line with this, e-Government systems would then provide information to support meaningful and purposeful activities of stakeholders (Checkland and Holwell 1998; Wilson 2002). This information can be then compared with the information provided by existing evaluation models or approaches. Suggestions to improve both e-Government services and the information they provide can be drawn to inform future policies and plans.

The following questions are inspired in the idea of an information system as a supporting system of organisational action (Checkland and Holwell 1998; Wilson 2002) and can help e-Government stakeholders elicit their perceptions about the support they receive from e-Government services:

- How does e-Government currently or potentially help you take purposeful action?
- What changes in existing e-Government services and what new services are required to provide adequate support to action?
- What information is required to assess this support?
- How can this information be obtained through current or new evaluation models or activities?
- How can new or emergent purposes be included in evaluation?

These questions could work best when stakeholders consider that there are genuine and noncoercive opportunities for dialogue and participation. Stakeholders should be able to feel at ease and share as well as represent their perceptions. In situations where people do not feel safe expressing themselves other methods (i.e. observations, confidential interviews) should be used.

Answers to the above questions would help people who are administering evaluation activities (evaluators) consider developing *systemic changes* to improve e-Government evaluation. An example of a systemic change is the following: A suggestion to improve the computer interface of an e-Government service (i.e. pay a single tax with a single click) is linked to an improvement in the underlying process, to a change in the law and even to a friendlier use of this service by both providers and users, all of which can generate a climate of mutual trust and learning. This type of change results from considering what is meaningful to people in a situation as well as defining agendas for action that cover technical, organisational and

cultural aspects (Checkland 1981). Under this pattern of practice, stakeholders should aim to propose systemic changes through e-Government evaluation as a way to ensure that e-Government systems serve different audiences within and beyond government.

2.6 Power-Based Pattern of Evaluation

In many societies the issue of stakeholder participation for evaluation of government plans and policies is contentious, as there are stakeholder groups (including government itself) who have greater influence than others in setting the agenda; this is also the case of e-Government (Chircu 2008). Whilst governments often pride themselves in making their activities more efficient, transparent or accountable via e-Government services, citizens and other stakeholder groups have divergent or opposing views about what has really been achieved. For instance, the processing of online welfare benefits might be regarded as a success in efficiency according to official government indicators, whereas it can be seen as a sign of exclusion or marginalisation by elderly or non-technology literate people.

Concerns of powerless stakeholders could remain invisible if they are not publicly acknowledged *and* addressed via policies or plans (Midgley 1992). Governments could find it challenging to acknowledge a diversity of views through their official channels (i.e. government websites or portals). They could also find it difficult to effectively use stakeholder participation, in particular, when using traditional models of e-Government evaluation. As expressed by Colombian evaluators,

> A citizen [stakeholder] who actively takes part [in contributing with ideas in the e-Government evaluation process] wants to know if his/her participation had an effect …the perception is that citizens' [online] comments are not taken into account…the more [and visible] feedback a citizen receives the more motivated s/he gets to continue participating…. (brackets added) (excerpt from interview) (Rodriguez and Cusba 2011)

This is not only a difficulty experienced in Colombia but elsewhere, where stakeholders do not see how their participation influences e-Government evaluation (Irani et al. 2005) and they can feel marginalised. Masked as a form of freedom, involvement of people in e-Government consultations or surveys becomes a constraint for them to do 'otherwise' than they are asked to (Foucault 1982, 1984). People become subjects of power; in other words, they become subjected to a particular way of evaluating that forces them to behave and act as prescribed.

However, this link between people and evaluation can (and should) be continuously *broken*. A power-based pattern of e-Government encourages stakeholders to make use of available systems and technologies (including existing e-Government systems and evaluation methods) to continuously analyse and redefine who they want to become according to their own ethics. Stakeholder groups can *also* use social media (blogs, forums, messaging) to respond to government decisions and policies or deliberate about/contribute to generate new ideas which are more attuned to what

they want (Petrizzo and Palm 2009). Both individuals and groups can exert pressure at different levels by mobilising, contributing to or influencing public opinion.

This pattern suggests the existence of a space of interaction between government stakeholders alongside 'traditional' communication channels in evaluation in which they can use social media technologies to interact according to what they think is ethical. This pattern enables the inclusion of social media content as a valuable source of evaluation data and thus the uneasy but necessary coexistence of different forms of evaluation of e-Government plans, policies and services. Under this pattern evaluation becomes a series of social-media-based evaluations, in which there are different goals being proposed, discussed or assessed, with different notions of efficiency being formulated and monitored by government and stakeholders.

However, evaluation under this pattern is not a one-sided set of activities. Governments themselves can also use social media to enhance their possibilities to show transparency and accountability (Bertot et al. 2010). An Internet-enabled evaluation pattern of practice like the one proposed here should also be considered a contested one in which different power relations are at play (Castells 2001). Thus, stakeholders should make careful use of this space, given that they can be reinforcing the very same power relations that they aim to resist (Henman 2010).

This pattern thus suggests continuous reflection and redefinition of evaluation activities and their purposes. The following questions could help stakeholders to devise ways to start thinking about how best to operate within possibilities and constraints that are offered by evaluation as a space for interaction:

- How do our contributions to both official and/or social media evaluations reinforce, resist or develop new knowledge about e-Government services and their notions of efficiency?
- What type of evaluation subjects are we becoming?
- Who do we want to become as individuals or groups?
- How can we use official and/or social media evaluation systems to serve our own ethical purposes?

These questions could also help people to reflect on how the use of the previous two patterns of evaluation (idealist and strategic) can have consequences in the activities of stakeholders and enable them to critically use evaluation activities to suit their own ethically driven purposes.

2.7 Concluding Remarks

This chapter has presented three different patterns as tools to help make the evaluation of e-Government more meaningful towards societal improvement. Traditional evaluation models make unquestionable assumptions about the meaning of efficiency which contribute to generate passivity in evaluation stakeholders. These models mask a number of limitations under their claims for objectivity.

The chapter has explored a case of e-Government evaluation in Colombia and provided insights into the challenges that arise in practice when traditional evaluation models are used in practice. Challenges are about the quantification of evaluation results, the role of evaluation experts and how evaluation can inform future action. Using ideas of systems thinking, a number of complementary patterns have been proposed to address these challenges and facilitate critical reflection and action in e-Government evaluation. These patterns foster joined-up thinking and collaboration between stakeholders whilst empowering them to contribute to e-Government evaluation and societal improvement.

Patterns can be used individually or in combination with each other because they address a number of different challenges in evaluation. Stakeholders should be able to decide what particular combination of patterns suits their own evaluation situation and context. The Colombian case illustrates that in practice evaluation challenges are interlinked. For instance, a need for better quantification in evaluation can lead stakeholders to discuss how best to use evaluation results and vice versa, and both of them have consequences for how people decide to meaningfully evaluate e-Government services according to what they think is ethical to do.

Many governments would welcome the possibility of new ideas about e-Government evaluation, only to realise that they need to 'let go' or question existing and ingrained evaluation ideas or 'best practices', some of which are being forcefully imposed externally (for instance, by international funding bodies). Other governments might acknowledge that their definition of how e-Government contributes to societal improvement is far from clear (Calista and Melitsky 2007). In either case, the proposed patterns and questions formulated in each of them can help e-Government stakeholders to start a conversation about e-Government as a serving system for society. From there, they can devise ways to act to advance in the accomplishment of desired ideals and purposes with this system in mind.

The practical use of the proposed patterns could have the following implications for e-Government evaluation:

- The assumptions about e-Government efficiency and how they are shared (or not) by different stakeholders should be questioned.
- The purposes of e-Government services should be discussed alongside their perceived support by stakeholders.
- The ethics of evaluation should direct stakeholder engagement.
- The use of social media in e-Government evaluation affairs should be encouraged.

At the *policy level*, the proposed patterns aim to challenge an existing 'command and control' mentality in policymaking, in which a predefined goal is not questioned but followed (Chapman 2002; Seddon 2008). To support patterns' use, e-Government evaluation policies should encourage and facilitate joined-up thinking, exploration of alternatives, continuous learning and genuine stakeholder participation according to the realities and possibilities of specific evaluation contexts. Insights obtained by the use of patterns should inform future policy definitions, and in this way policy formulation for e-Government and its evaluation can be richer and more

sensitive to the situations experienced by stakeholders. The patterns together have the potential to generate a learning system about e-Government policy and its evaluation or measurement that could benefit governments, other stakeholders and society in general.

The ideas of this chapter are far from definite in providing a silver bullet to improve e-Government evaluation. However, the insights and reflections aim to open up new directions for research in the practice of e-Government evaluation and in this way contribute to improve relations between governments and the societies that they serve.

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Chapter 3
How Open Are Public Government Data? An Assessment of Seven Open Data Portals

Sanja Bogdanović-Dinić, Nataša Veljković, and Leonid Stoimenov

Abstract Growing open data initiatives are offering different solutions for opening governmental data to the public. Open data platform solutions provide simple tools for enriching governmental portals with a data dimension. The new data-oriented shape of government inevitably imposes the need for the evaluation of government efficiency in light of open data. Regardless of the numerous initiatives, there is still no globally accepted open government evaluation framework. The purpose of the research presented in this chapter is to present and apply a model for assessing data openness, which relies on eight open data principles established by the Open Government Working Group. The model represents a new approach to the evaluation of open data with real-world application capabilities and is fully described throughout the chapter. As a confirmation of this model's capabilities, we illustrate the results of its application on seven data portals along with analyses, comparisons, and conclusions regarding the results.

3.1 Introduction

The concept of open government has been covered extensively in the academic literature over the past several years (Bertot et al. 2010; Veljković et al. 2012; Di Maio 2010; Gustetic 2010). Open data, transparency, participation, and collaboration are enumerated as the main attributes behind the concept of open government. The initiatives for introducing open government bring revolutionary changes into the traditional e-Government model, forcing a transition from service-oriented to data-oriented government. However, open government does not neglect e-services,

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which are still an important part of a successful online government, but rather extends the traditional approach with open data. Governments around the globe have recognized the advantages of opening internal data and information flows to the public and started to embrace the initiative by introducing strategies for the successful implementation of openness.

The benefits of making data public and freely available are numerous and are reflected in many different areas of application. Charlotte Alldritt, a public policy and transparency specialist and the current advisor in the UK Deputy Prime Minister's Office, noted the significance of openly available governmental data in delivering *innovative products*, *services and networks created by the public*, *private and civil society sectors* (Alldritt 2012). The 2009 Digital Britain Report described data as *new currency for the digital world* and *the lifeblood of the knowledge economy*, referring to the great potential of open data applications in business and the economy (Carter 2009). Open data offer new job openings; enormous information growth is followed by equal market growth and thus an increased need for specialists. Environmental challenges can be managed easily with the help of data. Public environmental data could be essential in making predictions, tracking behaviors, and making inferences based on recognized event patterns. That approach is the foundation for producing new knowledge and vital conclusions. Publicly available data are crucial for scientific activity that relies heavily on global collaboration based on large data collections. As the 2010 report "riding the wave" emphasizes, open scientific data have enormous potential to change the nature of scientific processes (High level expert group on scientific data 2010).

Many initiatives around the world have focused on defining open data catalogues and open data portals (data.gov.uk, digitaliser.dk, data.gouv.fr, etc.) (European Commission 2011). Some of them are already providing significant results and creating a path for others to follow. A direct consequence of the increased number of data portals has been the generation of large data piles, but the question is whether all published data are open data. What make data open? What are the features that separate open data from online data? What are the rules that need to be followed to distinguish open data? These are only some of the questions that call for an evaluation framework that can determine the extent of openness of published data. There are already several evaluation proposals and initiatives for assessing open data, which focus on data usage and some openness features (Osimo 2008; Berners-Lee 2010; Lee and Kwak 2011). They certainly represent a noteworthy source of experience and ideas and a strong foundation for further research in this area. We will review these initiatives throughout the chapter and emphasize their advantages and disadvantages. We will also debate the reasons behind our choice to develop a new data openness (DO) evaluation model rather than adopt the existing ones.

The focus of this chapter is evaluating data openness in the context of open government. The second section will introduce the reader with definitions of open data, as observed by the open government, and will provide an overview of the existing initiatives regarding the evaluation of data openness. The third section acts as an introduction to the model for evaluating the openness feature against eight openness characteristics defined by the Open Government Working Group (OGWG).

The data openness (DO) model is part of a larger e-Government Openness Index framework (eGovOI) intended to evaluate the level of a government's openness in the context of open data, transparency, participation, and collaboration features (Veljković et al. 2011a). The framework will only briefly be mentioned to provide the reader with the context of the openness component. The application potentiality of the proposed model is demonstrated on selected open data portals, and the results are presented. The assessment is performed automatically via Web tool, which is an implementation of the proposed model, but the tool itself will not be thoroughly explained because this task exceeds the scope of the presented research.

3.2 Open Data: Definition and Evaluation

The definition of open government data has been the subject of many academic and public debates. A precise definition of open government data is needed because it will ensure interoperability between different piles of government data (Gottschalk 2009) and enable their evaluation. To understand the *why* and *how* of open government data, we first need to discuss *what* open data mean.

Open data are data that are available for anyone to use and reuse without any restrictions and at no cost. As stated by Costa et al. (2012), the underlying rationale of open data is that *promoting unconstrained access to raw information enables its reuse and knowledge creation*. The Open Knowledge Foundation (OKF), as the world's best known promoter of open knowledge, has issued an *open definition* (Open Knowledge 2013):

> Open data is data that can be freely used, reused and redistributed by anyone—subject only, at most, to the requirement to attribute and share alike.

The OKF defines open data in general, but can we apply the "open" part to government-held data and thus define *open government data*? The British Government has done so. As stated in the British Government's Open Data Whitepaper (HM Government 2012), open government data are public sector information that is available as open data, which further implies that open government data meet the following three conditions: (1) accessible via the Internet at no more than the cost of reproduction and without limitations based on user identity or intent, (2) published in a digital, machine-readable format, and (3) free of restriction on use or redistribution in its licensing conditions. By contrast, Tauberer (2012) considers OKF's open data definition too weak for defining open government data because it allows the government to require attribution for data reuse. He looks at open government data as raw material that can be transformed and shaped into something different and more powerful.

Considering government-held data from the aspect of open government, we can talk about data relevant to government transparency, innovation, participation, and collaboration. In this regard, there is often confusion between open government data and data transparency. Open government data are related to government transparency,

but the transparency of government data should not be considered as an openness feature. Data can be open but not transparent. The aim of transparency for government data is enabling access to government-held data in a uniform way, making sure that data are well known, comprehensible, easily accessible, and open to all (Jaeger and Bertot 2010). We strongly distinguish these two features of data, which is why we have defined distinct indicators for their evaluation in the eGovOI framework.

If we agree to apply the open definition for government-held data, calling them open government data, the next step of our evaluation of data openness requires determining mandatory open data characteristics. Open data evaluation approaches and the selected open data characteristics found in the literature are given in Table 3.1.

Some of the given approaches include accessing a set of chosen open data characteristics to determine aspects of data quality or transparency (Ren and Glissmann 2012; European Commission 2011), whereas others are more oriented towards the evaluation of specific open data aspects, mostly data availability (Osimo 2008; Berners-Lee 2010; Socrata 2011). For example, Ren and Glissmann (2012) propose a five-phase process for identifying information assets as open data: (1) define business goals and develop business architecture, (2) identify stakeholders and prioritize information needs, (3) identify potential information assets for open data, (4) assess the quality of information assets, and (5) select information assets for open data initiatives. By going through these phases, stakeholders should be one step closer to the identification of open data. In the fourth phase of this approach, the authors apply quality assessment on open data. They have developed a questionnaire for the evaluation of data quality based on the fulfillment of six open data features, as shown in Table 3.1. Lee and Kwak (2011) propose a framework for open government maturity assessment. Within the framework, they evaluate the transparency of open data through assuring data quality in terms of accuracy, consistency, and timeliness.

Tauberer (2012) notes *defining* open government data qualities, namely, being open (accessible) and large (analyzable), and *desired* ones, being open, accurate, and authentic. Defining qualities can be observed as the minimal set of features that open government data must satisfy, whereas the desired ones represent optional features that, if implemented, make data even more open. In accordance with such an approach, Tauberer creates 17 openness principles and classifies them into five distinguished categories: the basic principles, data format, universality of use, data publishing, and the openness process (2012). The basic principles acknowledge the availability, primary, timeliness, and accessibility features of published data. Data format is concerned with the need for providing data in a machine-readable format. Universality of use assembles requirements related to license-free, nonproprietary, and nondiscriminatory data usage. The data publishing category focuses on features such as data permanency, promoting analysis, safe file formats, and provenance and trust, whereas the openness process category gives general recommendations on how to decide what to open using public input, public review, interagency coordination, endorsements of technology, and prioritization as guidelines.

David Osimo (2008) proposes a five stage model for measuring the availability feature of open data. If no data are available, the availability is considered *stage 0*.

Table 3.1 Overview of the different approaches of open data evaluation

Open data evaluation	Which aspects of open data to measure?
Quality aspect of open data (Ren and Glissmann 2012)	• Accessibility and availability • Understandability • Completeness • Timeliness • Error-free • Security
Open government maturity model (Lee and Kwak 2011)	• Accuracy • Consistency • Timeliness
Open government data principles (Open Government Working Group 2007)	• Complete • Primary • Timely • Accessible • Machine processable • Nondiscriminatory • Nonproprietary • License-free
Open government data principles (Tauberer 2012)	• Free access to data • Primary • Timely • Accessible • Machine processable • Nondiscriminatory • Nonproprietary • License-free • Permanent • Promote analysis • Safe file formats • Provenance and trust • Public input • Public review • Interagency coordination • Prioritization
Four-stage model of open data availability (Osimo 2008)	• Availability
Five-star model of open data availability (Berners-Lee 2010)	• Availability
Open data impact (European Commission 2011)	• Number of open datasets available • Timeliness • Data format • Reuse conditions • Pricing • Institutional positioning of the portal governing body • Accessibility • Take-up by citizens • Take-up by app developers • Number of applications developed on open data
Open data benchmark (Socrata 2011)	• Accessibility • Availability

If data are obtainable, availability reaches *stage 1*. When data are available in a nonreusable and non-machine-readable format, the availability is a *stage 2*. If data are in reusable and machine-readable formats, the availability reaches *stage 3*. Finally, if the stage 3 conditions are fulfilled and data are visualizable, the availability is stage *4*. Although this model lacks in the assessment of data quality and does not consider linked data, it still represents a solid foundation for future initiatives and a strong starting point for the development of open data evaluation.

Sir Berners-Lee (2010) proposes a star rating system for assessing the extent of public data availability. This model focuses on linked open data and is intended for wide application. According to the rating system, the data receive one star if they are available on the Web with an open license. If data are published as machine-readable-structured data, they receive two stars. Three stars are appointed to data published in nonproprietary formats. If data comply with all of the above rules and additionally use Semantic Web standards to identify things, they receive four stars. If all of the above rules are met and links to other people's data exist to provide context, the data receive five stars. As Berners-Lee noted, to apply this model to government data, a new requirement should be added: published metadata about the datasets.

The first three levels of the five-star model match stages 1–3 from Osimo's model, whereas the latter two focus on the linked features of data. A higher value is given to data that can be easily reused and whose context is well described through linked information, thereby promoting the need for efforts towards data structuring and formatting rather than simply publishing PDF files. Both approaches, the five-star and four-stage model, focus on only one open data feature: data availability. Although it is one of the key features that defines open data, it is not the only one; therefore, neither of the mentioned evaluation models could be used alone to measure the level of openness of public data.

The European Commission (2011) has also showed an interest in assessing open data and performed a study on open data portals' impact through a Web survey of selected portals in Europe and elsewhere in the world and in-depth interviews with government representatives (European Commission 2011). During the analysis of the gathered results, they applied the Berners-Lee five-star model to measure the level of data availability and defined more detailed sub-indicators for clearly expressing each result. However, the study did not go any further than listing the obtained results. They did not define any calculation to classify analyzed portals on a scale of openness or the impact of open data. Therefore, this study is an excellent resource regarding benchmark methodology, but it lacks in processing methods, which are essential for assessing, categorizing, and comparing different open data initiatives.

Socrata Company (2011) took a different approach and performed a study on open government data through three independent surveys of government, citizens, and developers. The surveys were conducted in the form of questionnaires with the goal of broadly assessing open data not only from the perspective of the government but also from the perspectives of its data consumers and contributors. The results were organized into five categories: attitudes and motivation, current state of open data initiatives and programs, current state of data availability and accessibility, high value data, and engagement and participation. Although this extensive study is of

significant importance because it directly reflects opinions, attitudes, and motivations behind three major stakeholder groups, it is solely based on interviews and pure trust in respondents' answers and does not reflect the state of data analyzed from different points of view, using different techniques. Therefore, this study cannot be observed as sufficient, but it does impose some significant aspects that should not be neglected in the process of open data evaluation.

The Open Government Working Group (2007) has defined a set of eight principles of open government data. These are primary, complete, timely, accessible, machine processable, nonproprietary, nondiscriminatory, and license-free and are now globally accepted as guidance for opening governmental data.

Open Data Principles Adopted for DO Evaluation: Based on the analysis of open data requirements and evaluation initiatives, which is thoroughly presented above, and after carefully reviewing the cited sources, we embrace the OGWG's eight open government data principles as a foundation for our DO evaluation model. We found the OGWG's definition to most clearly reflect government requirements for open data. Other initiatives focus on open data in general (Ren and Glissmann 2012; Lee and Kwak 2011), not specifically government-held data. The recognized indicators in other analyzed benchmarks can be mapped onto these eight characteristics. For example, the *quality aspect of open data* addresses error-free and security features. The error-free feature can be observed as part of the *primary* data feature because original data are expected to be accurate. By contrast, security relates to accessing data. Because openness implies free access to anyone, security can be analyzed as part of data accessibility. Accuracy and data consistency, which are emphasized as indicators in the *open government maturity model*, can be observed as part of the primary feature for the same reasons as the previously explained error-free feature. The European *open data impact* framework provides many indicators that are similar to the OGWG's eight characteristics (timeliness, data format as machine processable, pricing and reuse conditions as license-free, accessibility), but they also go beyond the scope of the OGWG and define additional indicators, such as the number of datasets, institutional positioning, the number of applications, and take-up by citizens and developers. As will be seen later in the chapter, some of these indicators can be observed as possible extensions of our DO model. Tauberer gives a very detailed analysis of the principles of open government data, but he seems to overlap the principles of open data (the first eight principles) with the principles of open government (the last eight principles). If we exclude the principles of open government from Tauberer's proposal, the result would match the OGWG's definition.

3.3 Benchmark Model for Evaluating Data Openness

We are addressing data openness in terms of eight openness characteristics established by the Open Government Working Group (2007). We present an evaluation method that is based solely on information made available via governments' data portals. The method is implemented as a Web-based assessment tool.

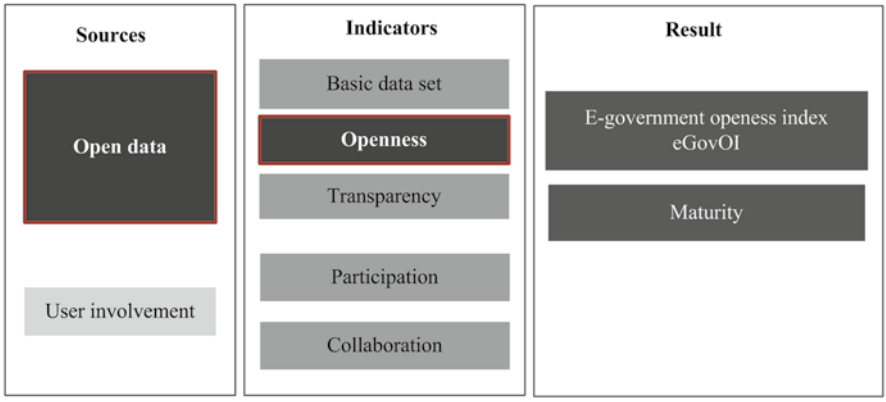

Fig. 3.1 Data openness evaluation: components and position in e-Government Openness Index framework

The general idea behind this approach is to enable openness assessment at any time and, more importantly, to automate the entire process by exploiting available open data portals' APIs. Keeping in mind the increased popularity of the Comprehensive Knowledge Archive Network (CKAN) open data platform among governments and, consequently, its increased utilization, we have developed a Web tool that utilizes CKAN API and enables data openness index calculation relaying solely on API calls and data published on the portal. We will further present our data openness model, starting with the more general scope of the e-Government Openness Index Benchmark and later discussing the aspects of assessment and explaining how these aspects have been evaluated based on open data meta-descriptions. At the end of this section, we will provide the results from the application of model to seven open data portals.

3.3.1 Open Government Benchmark: Data Openness Indicator

Our research regarding the evaluation of open government has resulted in a benchmark model for assessing the extent of governments' openness in accordance with well-defined and globally embraced openness principles. The benchmark is fully described in Veljković et al. (2011a) and is intended for the exploration of government openness boundaries and determination of the extent of fulfillment of open government's main goals.

Figure 3.1 depicts the main benchmark's building blocks as well as the relationships between them. There are five indicators that reflect the main open government concept features: a basic dataset, openness, transparency, participation, and collaboration. These measures are calculated based on available sources and used for computing the final benchmark results: the e-Government Openness Index and maturity.

Table 3.2 Data openness levels

DO value (%)	DO level	Description
0–5	*0—cradle*	The government has only started to publish data on a data portal. The majority of mandatory data categories are still empty, and data are not entirely described
6–35	*1—basic openness*	Data are published under open licenses, and meta-descriptions are made available; however, not all required descriptions are present. The majority of data are published in DOC, XLS, or other non-processable and/or proprietary formats
36–75	*2—average openness*	Data are published in original form and are regularly updated. They are mostly published in TXT, PDF, CSV, and other processable and nonproprietary formats. However, there is no semantics attached to the data descriptions, and the majority of data are not linked to other data
76–90	*3—openness*	The majority of data are published in RDF, XML, and other semantic formats, available to anyone and linked to other data
>90	*4—high openness*	Data are complete and in accordance with all 8 data openness principles

The focus of this chapter is on open data assessment; therefore, we will further address only the parts of the benchmark that are concerned with this aspect, *open data* sources and *openness* indicators, which are indicated in orange in Fig. 3.1. We will reference this approach as the data openness (DO) model. The aim of the DO model is to evaluate the degree of openness of government data made publicly available on an open data portal. The model relies solely on data features' descriptions collected directly from the open data portal. We aim to develop a tool that can estimate governments' data openness online, without human intervention. To perform this deep openness estimation, the model would have to be expanded with other assessment tools, such as questionnaires, which would provide a wider range of information and address different stakeholders.

3.3.2 Data Openness Model

After examining the existing data evaluation models, we have developed a DO evaluation model that perceives the openness of government data through the following indicators: *complete*, *primary*, *timely*, *accessible*, *machine processable*, *nondiscriminatory*, *nonproprietary*, and *license-free*. These indicators match the OGWG's eight open data characteristics (Open Government Working Group 2007). The calculation of DO is performed by grading each indicator with a maximal score of 1 and finding the average value of all indicators. We named the final DO value the DO Index (DOI), which has a range of (0, 1).

Table 3.2 presents data openness levels based on the achieved overall score, expressed as percentages. We define five openness levels: *cradle*, *basic openness*, *average openness*, *openness*, and *high openness*. Cradle openness is intended to

simply acknowledge the existence of an openness initiative and recognize the efforts towards embracing openness principles. As the government progresses in the development of open data, it will advance through the defined levels. The category *high openness* is the most sophisticated level of open data, to which every government strives.

To establish a standard evaluation measurement model, it was necessary to establish some standard set of mandatory categories that each portal should implement, considering the fact that online data are organized into various data categories or tags. We have performed an analysis on the available open data portals around the world from the aspect of the supported data categories. Based on the gathered results, we have defined a basic dataset comprised of nine data categories: Finance and Economy, Environment, Health, Energy, Education, Transportation, Infrastructure, Employment and Population (Veljković et al. 2011b). Each category is comprised of datasets with sizes ranging from one to hundreds or even thousands of pieces of data, depending on the publishing sources. Therefore, sample sizes for datasets in the categories were needed, imposing as additional aspect of the DO model.

The aspects of the DO model can be divided into two categories: measurement indicators and the data categories' sample size. Measurement indicators directly reflect the level of satisfaction about openness principles for a data portal, whereas choosing a proper sample size is vital for obtaining the most accurate results. Considering their importance for the implementation of the DO model, these two categories of aspects are further analyzed separately.

3.3.2.1 DO Measurement Indicators

The indicators of the DO model are presented in Table 3.3 along with a brief insight into their structure and grading.

The CKAN platform enables entering and providing meta-descriptions of datasets in the form of structured documents, where each feature is described via a pair [tag: value]. *Tag* is a feature name (notes, relationships, url, etc.), and *value* is usually a textual value for a feature. Our model relies on these descriptions during the evaluation process. A detailed description of tags is not presented here because it exceeds the scope of this research. However, we will provide short explanations for each used tag to better explain the indicators' contexts (Fig. 3.2).

Open data are *complete* if the following conditions are satisfied: they are published with available meta-description, in a machine-readable format, linked to other data and directly downloadable. Assessment of these conditions is performed based on meta-tags describing each particular dataset: the description is available if a tag [notes] contains some text and if, for each available resource, tag [description] contains some text. However, we cannot evaluate whether the contained text makes sense or whether it is actually related to a particular dataset. Data can be downloaded if, for each available resource, there is a [url] tag containing a download link. A dataset is machine readable if its resources are published in formats that allow computer processing. A dataset is linked to other datasets if there are listed links in the [relationships] tag.

Table 3.3 DO model indicators

Indicator	What to measure?	How to measure?	Score
Complete	1. Description is available—0.25	1. [notes] + resource => [description]	(0, 1)
	2. Can be downloaded—0.25	2. Resource => [url]	
	3. Machine readable—0.25	3. 0.25*MachineProcessable	
	4. Linked—0.25	4. [relationships]	
Primary	Are data provided raw, in original form?	[format] ∈ {CSV, TXT, XML, RDF} => score 1	(0, 1)
		[format] ∈ {XLS, DOC} => score 0.5	
Timely	1. Time period—0.3	1. extras => [temporal_coverage_from] and [temporal_coverage_to]	(0, 1)
	2. Update frequency—0.4	2. extras => [update_frequency] or [frequency_of_update]	
	3. Last update—0.3	3. resource => [last_modified]	
Accessible	Are data accessible to anyone for any purposes?	License_free + Resource => [url]	(0, 1)
Machine processable	PDF/XLS—0.2	[format] ∈ {PDF, XLS} => score 0.2	(0, 1)
	CSV/HTML/TXT—0.5	[format] ∈ {CSV,HTML,TXT} => score 0.5	
	XML/RDF—1	[format] ∈ {XML,RDF} => score 1.0	
Nondiscriminatory	Are data available to anyone?	Accessible + MachineProcessable	(0, 1)
Nonproprietary	Are data available in nonproprietary formats (not DOC/XLS/CDR/PSD)?	[format] ∈ {XLS, DOC, CDR, PSD, NULL} => score 0	(0, 1)
License-free	Are data published under open license?	[is_open]	(0, 1)
DO			(0, 8/8)

TAG name	Content Description	Usage example
[notes]	Textual description	notes: "The database contains satellite proprietary format on various types of ..."
[description]	Textual description	description: "2008 Report",
[url]	Download link	url: "http://www.ic.nhs.uk/statistics-and-data-collections",
[relationships]	Links to other datasets	relationships: [],
[format]	Data format	format: "CSV", format: "XLS",
[temporal_coverage_from]	Temporal reference	temporal_coverage-from:"["1972"]",
[temporal_coverage_to]	Temporal reference	temporal_coverage_to:"2008",
[update_frequency] [frequency_of_update]	Textual description	update_frequency:"Weekly"
[last_modified]	Data and time	last_modified:"2013-04-13T03:09:22.098385",
[is_open]	Boolean true/false	isopen: true,

Fig. 3.2 Description of datasets' tags used in the evaluation process

Data are *primary* if they are published raw and in their original format directly from firsthand experience. If they are published in any pre-analyzed format, they are not considered primary. From the aspect of evaluation, the primary indicator is assessed based on the [format] tag for each available resource in dataset. If a resource is published in CSV, TXT, XML, or RDF format, it is most likely original because these formats allow the representation of structured data (the results of data collection processes, sensor readings, etc.). If a resource is published in XLS or DOC format, there is a significant possibility that the data were already processed and published in the form of a chart or graph. However, there is also the possibility that it is in its original format, which is why we have chosen to grade it with 0.5. In any other case, we consider data not primary and grade them as 0.

Data are *timely* if they contain information describing their timeliness (i.e., what period is covered by the data held in a dataset, how often the data are updated, and when the last update was). We give the highest sub-value to the update frequency feature because we consider it the most important in terms of keeping data as accurate as possible. The update frequency receives the highest score if the period covered by the dataset contains the present date and if the time interval that has passed since last update is smaller than the indicated update frequency value. We evaluate this feature by checking whether there is available information contained in the [update_frequency] or [frequency_of_update] tags for each resource. Time period is defined with the [temporal_coverage_from] and [temporal_coverage_to] tags, whereas the last update can be read from the [last_modified] tag.

Data *accessibility* imposes the rule that data should be accessible to everyone equally, regardless of the purpose. The data accessibility indicator has a maximum score if there is no policy regarding data usage. We evaluate this indicator through the *license-free* indicator and the downloadable feature of the *complete* indicator. If data are published under an open license, then they are accessible to everyone equally. If data are downloadable without additional conditions, they are also equally accessible to anyone.

The *nondiscriminatory* indicator reflects freely available data. We acknowledge that a dataset is nondiscriminatory based on its accessibility and machine processability, which means that a dataset is license-free, downloadable, available in machine-processable formats, and, consequently, ready for free usage among users. The nondiscriminatory indicator receives a maximum value of 1 if data are provided under the same conditions to each user. If, for example, user registration is required to download data, the indicated is scored as 0 and considered discriminatory.

Machine processable means that data are provided in a structured format that can be processed by a computer. The calculation recognizes three evaluation levels, which are actually adapted from the *5-star open-linked data model*: level 1, formats that are not machine processable (e.g., PDF, XLS): level 2, structured formats that can be automatically processed but do not contain any semantics (e.g., CSV, TXT, HTML); and level 3, structured formats that include meta-descriptions and semantics (e.g., XML, RDF). Level 1 receives the lowest score, 0.2, which simply gives credit for publishing data, even though they cannot be utilized for any type of processing. Level 2 receives a score of 0.5, considering that data in CSV format are of

a predictable structure and can very easily be further processed. Level 3 receives the highest score because in addition to properly structured data, additional information is provided that could enable highly sophisticated data processing. The calculation is performed by examining the [format] tag for each available resource within a dataset and finding the average score.

The *nonproprietary* feature relates to the previous one by considering data formats from the aspect of the supported processing programs; in that manner, for datasets available in a format that requires commercial Microsoft Excel or Microsoft Word programs for access, such as XLS or DOC, this feature is given a value of 0. For formats that do not require any specific, commercial program, such as CSV, XML, and RDF, this feature is given a value of 1. The estimation is, as for the machine-processable indicator is concerned, performed by examining the [format] tag for each available resource and calculating the average score.

Finally, the *license-free* feature relates to free access to data. It is scored 1 if data are published under an open license, which is found by examining whether the [is_open] tag for a dataset is set on true or false. If it is true, then the dataset is published under an open license. If it is false, then the dataset is not open.

3.3.2.2 Choosing a Relevant Data Subset

Keeping in mind that this issue is a statistical challenge, we have chosen a statistical approach to obtain a reliable method for determining the sample size with given restrictions such as the confidence level and the margin of error. Equations 3.1 and 3.2 represent the chosen formulas (NIST/SEMATECH 2012):

$$ss = \frac{Z^2 * p * (1-p)}{c^2} \tag{3.1}$$

$$ss = \frac{ss}{1 + \frac{ss-1}{pop}} \tag{3.2}$$

Equation 3.1 explains the process of calculating the sample size (ss) based on the confidence level (Z), margin of error (c), and expected accuracy (p). The margin of error indicates the precision of the chosen sample and the allowed deviation of the expected results. In our calculations, we used a 10 % value for the margin of error, which means that if 45 % of datasets in a chosen sample have demonstrated a specific feature, we can be "sure" that that feature has been demonstrated by the entire relevant datasets between $(45-10)$ and $(45+10)$% of the sample size. The confidence level tells how "sure" we can be (i.e., how often the true percentage of the sampled data satisfying the required condition lie within the confidence interval). Usually, Z is chosen to be 90 or 95 %. We have chosen a 95 % confidence, for which Z takes a value of 1.65 in the calculation according to the table of standard normal curve area values. This means that we can be 95 % "sure" that datasets from a chosen sample that satisfy the chosen condition are in the defined confidence interval,

which is between (45 – 10) and (45 + 10)%. Accuracy denotes the percentage of the sampled data that truly satisfy the required features. Because there is no trustworthy way to reliably predict such a percentage, we have used a value of 50 %.

Equation 3.1 calculates the sample size for a very large population because the population size usually has no influence in statistics-related issues. However, when a population is finite, small, or relevant for the problem, it is important to obtain a size for the sample that is sufficient for the analysis. In the case of open data evaluation, we found that the size of data categories (which represent our population) is important for the final results; therefore, we have introduced Eq. 3.2, which performs corrections of the calculated sample size according to the true size of the data category, denoted as pop.

3.3.3 A Use Case Study: DO Tool in Action

For the purposes of testing the DO model's capabilities, we have performed an analysis of data openness for the following open data portals: the USA, the UK, European Union, Germany, Ottawa Canada, Austria, and Queensland data portals. We have chosen these portals because they all run on the CKAN open data platform, and our tool currently supports only CKAN[1]. The USA and the UK represent the oldest portals, launched in May and September 2009, respectively, and are the first initiators of the "open data portal" idea. By contrast, the European Union, Germany, and Ottawa Canada portals are the youngest, officially published in February (EU and Germany) and June (Ottawa) 2013. Austria and Queensland are in the middle, having been published in April and December 2012, respectively. It was interested to see how these portals compared to each other and whether their "age" and attained maturity had any influence on the final score. Table 3.4 gives an overview of the assessed data portals, along with information about the sizes of the nine mandatory categories for each portal. This information is important for analyzing the DO results from the aspect of the number of published datasets.

The process of calculating the DOI was performed automatically via our Web tool. For each portal, the tool first finds all available tags per category (subcategories) based on the provided keywords that describe those categories. For example, for Finance and Economy, we have provided two keywords: finance and economy in English and German. The second step is calculating a sample size for each tag based on the obtained information on the number of datasets per tag and randomly chosen datasets to form a sample. The third step is calculating the eight indicators for each dataset from a sample according to the rules explained in Table 3.3. The final DOI is calculated as the average of the DO indices for each data category. The data category obtains its DOI as the average of all its tags' DO indices.

[1] In addition to CKAN, other open data platforms are used around world governments, including Socrata (Kenya, State of Washington, City of Chicago, etc.), Junar (City of San Jose, City of Las Vegas, Government of Costa Rica, etc.), and the Open Government Platform (Ghana, Rwanda, India, etc.).

Table 3.4 Overview of analyzed data portals

			Number of tags (subcategories) per category								
Data portal	URL	Year launched	Finance and Economy	Environment	Health	Energy	Education	Transportation	Infrastructure	Employment	Population
USA	data.gov	2009	5	2	2	1	1	1	0	3	1
UK	data.gov.uk	2009	105	99	237	33	117	87	11	86	72
European Union	open-data.europa.eu	2013	5	4	17	15	13	0	0	14	10
Germany	govdata.de	2013	142	22	54	46	0	21	3	0	7
Ottawa, Canada	data.ottawa.ca	2013	1	1	2	0	0	1	0	0	0
Austria	data.gv.at	2012	11	4	1	6	0	2	2	1	5
Queensland	data.qld.gov.au	2012	2	2	2	1	4	2	1	2	1

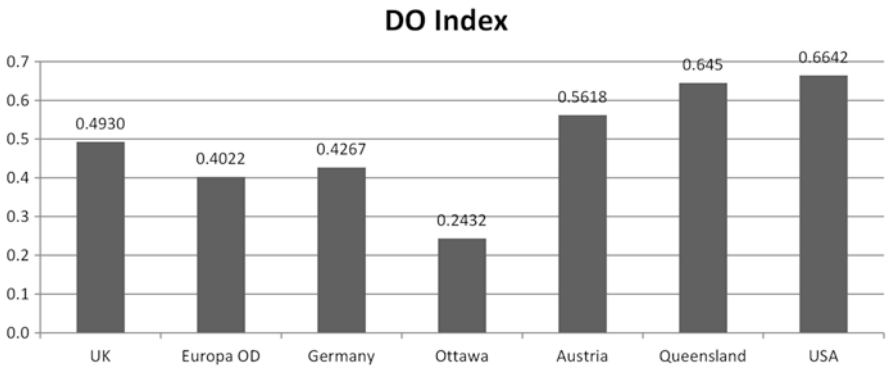

Fig. 3.3 Data openness index for analyzed data portals

Figure 3.3 illustrates the results of the DOI calculation. As can be observed, the highest score was achieved by the US data.gov portal, 0.6642, which indicates 66.42 % openness, belonging to the *average openness* category according to Table 3.2. The lowest score was achieved by Ottawa, Canada, 0.2432, which indicates 24.32 % openness and places Ottawa in the *basic openness* category. All other data portals place in the *average openness* category and achieved similar results. On average, the DOI was approximately 49.08 %. The UK, Austria, Queensland, and the USA scored higher than the calculated average; thus, we can consider them *high-average open*. Europe and Germany were below average, approximately 40 %; therefore, they can be considered *low-average open*. Ottawa is the only portal in the lower category, which points to the necessity for further openness improvements.

A closer look at the results provides information regarding the successful, less successful, and challenging aspects of each analyzed portal. For example, if we look

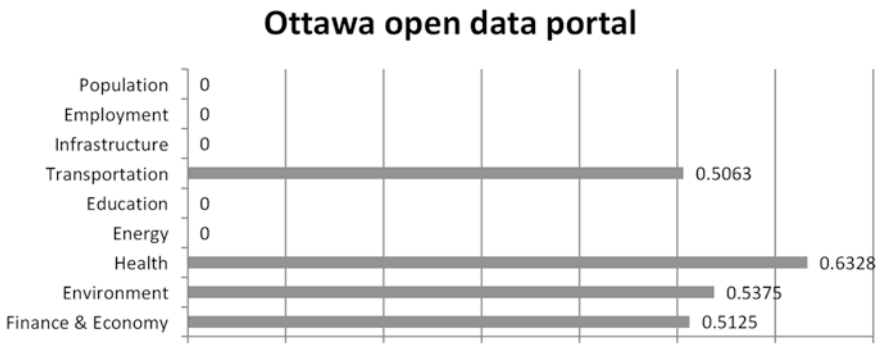

Fig. 3.4 Ottawa's data portal assessment results

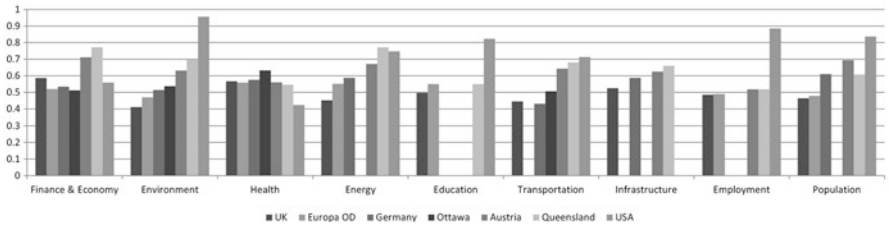

Fig. 3.5 Data.gov detailed categories' data openness assessment

at Ottawa's detailed information per category (Fig. 3.4), we can see that five out of nine mandatory categories are empty. This is certainly a significant cause for the low DOI. All other categories are above 50 %. Therefore, Ottawa should focus on providing data to the missing categories to improve its score. To improve the DO for each category, the detailed results per category should be analyzed from the aspect of the eight openness indicators.

Figure 3.5 provides a comparison of the DO indices among the analyzed data portals, achieved per category. We can see that US data.gov, as the overall highest scoring portal, achieved the best results in five out of nine categories, whereas Ottawa, the overall lowest scored, received the best score for the Health category. The worst graded category, if we exclude those with a score of 0, was the Transportation category on the German data portal, with 43.13 % DOI. The highest score, 95.59 % DOI, was attained by the US data portal for the Environment category. Education and Infrastructure are the least implemented categories, in only four out of the seven data portals, whereas Finance and Economy, Environment, and Health are present in all the analyzed portals. By analyzing in detail the results for the Transportation category of the German data portal, it was concluded that the critical indicators are timely, machine processable, and nonproprietary. The timely indicator achieved a score of 0, indicating a complete lack of timeliness for information for datasets (update frequency, publishing date, temporal coverage, last modified date). Machine processable and nonproprietary achieved scores of 0.24 and

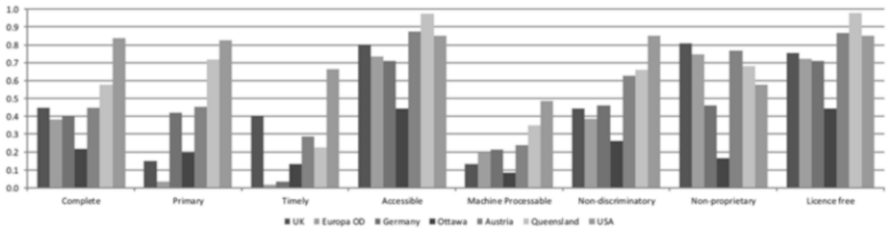

Fig. 3.6 Average scores of indicators

0.39, respectively, due to data being published mostly in PDF, DOC, XLS, and other non-processable and/or proprietary formats. Improvements in the machine-processable indicator, by making data available in processable and semantically enriched formats (XML, RDF, CSV, etc.), would also be reflected in the complete, accessible, and nondiscriminatory indicators because they are directly related to the machine-processable feature in the calculation process. Consequently, such modifications would inevitably lead to an improved overall DO score for the Transportation category of the German data portal.

Figure 3.6 gives an overview of the average scores of indicators per data portal. The best evaluated indicator is *license-free* on the Queensland's data portal, with 97.67 % DO. Close behind is the *accessible* indicator on the same portal, with 97.56 % DO. The US data.gov portal received the best scores for the accessible, nondiscriminatory, and license-free indicators, all approximately 85 % DO, and achieved the lowest score for the machine-processable indicator, with 48.82 % DO. Ottawa's highest scores were for the accessible and license-free indicators, both approximately 44 %, whereas timely and nonproprietary received the worst grades, approximately 13 % and 16 %, respectively.

The overall lowest score was achieved by the European open data portal for the timely (only 1.82 %) and primary (3.64 %) indicators. The detailed score of the European portal shows that both of these features are supported by only three out of the nine data categories and achieved very low scores in those three categories. The primary feature is related to data formats in the calculation process. The results show that these are available in XLS, DOC, or similar, and it cannot be ensured with 100 % confidence that the data are in their original form. A low score for the timely indicator is the direct consequence of a complete lack of timeliness-related information in the dataset's meta-descriptions. To improve low scores, it is necessary to provide detailed meta-descriptions and ensure that the data are published in appropriate formats. These findings draw attention to the necessity for improvements in these indicators for the EU data portal.

Younger data portals generally lack data, resulting in empty data categories and 0 scores for some indicators. This finding is expected but not sustainable. These portals should constantly work to improve their content regarding both the size of the data category and the dataset's meta-descriptions. However, the final results pinpoint a problem common for all portals, regardless of their experience: a low score for the

machine-processable indicator. The highest graded for this indicator is the US data.gov, with a score lower than 0.5, which means that every analyzed portal publishes data mostly in PDF, DOC, XLS, and other non-processable formats. Data publishers should be introduced to the benefits of semantically enriched data and encouraged to provide data in various formats, including XML, RDF, CSV, and similar formats.

3.4 Discussion and Future Work

The concept of open government has spread rapidly across the world's governments. Open data are a leading concept of Open Government. Publicly available governmental data mean more transparency, efficiency, and legitimacy, in addition to helping citizens build long and steady trust in their government. Many open data definitions have been created to establish a set of principles behind the development of open government. Although these definitions seem different, they are actually quite similar and point to some common defining features: completeness, timeliness, accessibility, machine readable, nonproprietary, nondiscriminatory, primary, and license-free. As a result, initiatives have been created measuring the extent of data openness. Although there have been several attempts at building openness assessment models, a standard and globally accepted evaluation approach that would enable estimating and comparing the openness advancements of the world's governments still does not exist.

Joining the openness pioneers, we have developed a model for evaluating the level of openness based on the information on open data available from open data portals. The model was implemented as a Web tool for the automated evaluation of openness and offers assistance in the process of building openness principles. As described throughout the chapter, it relies on eight open data principles and provides information on the level of openness of governments' data. The model was applied to seven selected data portals for to demonstrate its capabilities and possible results. Throughout the estimation process, we verified different types of analyses that could be performed on the resulting data and which presented the different aspects of the generated values.

Defining a new model and developing a tool for the automated assessment of data openness offer a significant advantage for the assessment process itself; now, the process can be performed at any time, without any type of human intervention, quickly and uniformly by following the predefined rules. This advancement is of great significance for governments, which can continually track their portal's performance regarding data openness, and for other stakeholders and policy makers, who can easily obtain information on what needs further improvements and what has achieved notable success. As the main strength of our DO model, we emphasize chosen indicators. By defining rules for their assessment, we have enabled a standardized application of the developed model on different governments' portals with the possibility of their comparison from various data aspects as well as comparative analyses of their current openness.

However, there are still some issues that need to be addressed in the future, which we will shortly summarize in the following paragraphs.

One important issue that has arisen concerns the DO model's scope: *Can data openness be measured only based on the chosen eight openness principles, or should data transparency be considered as well*? We see data transparency as an important aspect for analyzing open data and define it through data authenticity, understandability, and reusability. However, data can be open but not transparent. Although there are similarities between these two data aspects, we see them as separate data features and choose not to mix them. In our model for the evaluation of open government (Veljković et al. 2011a), we define openness and transparency indicators separately, with each dealing with different aspects of open data. The Transparency indicator considers data transparency and addresses related issues.

Throughout the development and application processes, we encountered some challenges that have imposed doubts related to some of the model's core features. The first and most obvious question asked was as follows: *Should the size of data categories have any impact on final DOI*? Indeed, if, for example, we take a look at the detailed results for the UK and Ottawa data portals, we can see that the UK scored 48.18 % DOI for the Health category with 237 tags, whereas Ottawa has scored 48.75 % DOI for the same category, with only two tags. The model places Ottawa higher than the UK because it now neglects the categories' sizes. Related to this issue, another question is logically raised: *Should we consider the portal's experience when calculating DOI*? In this way, we can acknowledge years of efforts and prevent the situation of newly built data portals with only a few tags and datasets receiving better scores than the more experienced portals. The UK's open data portal has more experience than Ottawa's because it has existed longer. If we calculate the UK's experience, would we obtain different DOIs, and would that new DOI better reflect the real state of openness of the data portal? We believe that experience and data categories' sizes should be involved in the calculation process as new indicators or simply as factors that would enhance/amplify portal's DOI. This area is one of our future model improvements, the research for which is already underway.

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Chapter 4
Measuring Usability to Improve the Efficiency of Electronic Signature-Based e-Government Solutions

Thomas Zefferer, Vesna Krnjic, Klaus Stranacher, and Bernd Zwattendorfer

Abstract Usability and security are crucial requirements of efficient e-Government services and applications. Given security requirements are mostly met by integration of approved cryptographic methods such as two-factor authentication and qualified electronic signatures. Integration of these technologies into e-Government applications usually introduces additional complexity and often affects the usability of these solutions. So far, research on usability as efficiency-measuring instrument in e-Government has primarily focused on the evaluation of e-Government Web sites only. Usability issues raised by the integration of security-enhancing technologies into e-Government applications have not been considered in detail yet. We filled this gap by conducting a usability analysis of three core components of the Austrian e-Government infrastructure to improve efficiency in this domain. The evaluated components act as middleware and facilitate integration of e-ID and e-Signature tokens such as smart cards and mobile phones into e-Government applications. We have assessed the usability and perceived security of these middleware components by means of a thinking-aloud test with 20 test users. This chapter introduces the evaluated components, discusses the followed methodology, and presents obtained results of the conducted usability test.

4.1 Introduction

During the past years, e-Government solutions have evolved towards complex systems involving a broad spectrum of different players and stakeholders. In this context, particularly citizenry represents an important stakeholder. Citizens play

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a central role in e-Government solutions mainly for two reasons. First, citizens indirectly finance the development and maintenance of e-Government solutions through taxes. Second, citizens represent one of the main beneficiaries of e-Government solutions. Therefore, citizens have a strong interest in successful, high-qualitative, and efficient e-Government solutions.

While efficiency apparently represents a global requirement for e-Government solutions, the term efficiency itself can actually have diverging meanings and implications for different stakeholders. Regarding the special importance of the stakeholder citizenry, citizens' interpretation of the term efficiency needs to be taken into account when evaluating e-Government solutions.

For citizens, e-Government solutions are typically efficient if they help to reduce efforts and save costs. Hence, from citizens' point of view, e-Government solutions should mainly be fast, cheap, and convenient to use. In other words, e-Government solutions should provide an appropriate level of usability. Hence, there is obviously a close correlation between the usability of an e-Government solution and its efficiency. This obvious correlation between the aspects efficiency and usability has been discussed in detail by Frokjaer et al. (2000). From a citizen-centric view on the term efficiency, usability can hence be derived as key requirement and success factor of efficient e-Government solutions that aim to satisfy citizens' needs (Gil-García and Pardo 2005).

While usability definitely represents a key requirement for efficient e-Government solutions especially from the citizens' point of view, also other aspects need to be taken into account. As citizens have a strong interest that private data being processed in e-Government processes are appropriately protected, suitable security measures usually need to be integrated into nowadays e-Government solutions.

Security is of special importance for complex transactional applications that potentially comprise transmission and processing of security-critical and privacy-sensitive data. This has been discussed by Zavareh et al. (2012) in detail. The findings obtained by Zavareh et al. are consistent with several other studies, such as those from Geetha and Malarvizhi (2010), Howcroft et al. (2002), and White and Nteli (2004). To meet given security requirements, usually approved cryptographic methods such as strong user authentication schemes and electronic signatures are employed. In this context, electronic signatures play an important role especially in the European Union, where qualified electronic signatures are legally equivalent to handwritten signatures according to the Directive 1999/93/EC of the European Parliament and of the Council on a Community framework for electronic signatures (EU Parliament and Council 2000).[1] To meet the requirements of qualified signatures as defined in this directive, a secure signature-creation device (SSCD) has to be used to securely store cryptographic keys and to compute electronic signatures.

Since SSCDs typically rely on a secure hardware token, implementation alternatives are limited. Most e-Government solutions require citizens to use personalized

[1] At the present time, this Directive is still the basis for electronic signatures across Europe. However, the European Commission is currently working on a new proposal for a regulation (EU Parliament and Council 2012).

smart cards in order to create legally binding electronic signatures. Smart card-based solutions are already in productive operation in Austria, Belgium, Estonia, Portugal, Spain, and various other European countries (Siddhartha 2008). Some European countries such as Austria or Estonia additionally provide citizens mobile signature-creation solutions. These solutions use mobile phones as hardware tokens instead of smart cards.

Regardless of the type of the used hardware token, the question arises how these tokens can be used and accessed by e-Government applications, e.g., to securely authenticate citizens or to create electronic signatures. Currently, most countries rely on some kind of middleware, which acts as intermediary between hardware tokens and e-Government applications. This approach is also followed in Austria, where several different middleware implementations have been developed during the past decade. These implementations allow Austrian citizens to securely authenticate at remote services and to create qualified electronic signatures by using either personalized smart cards or their personal mobile phones.

Representing core components of the Austrian e-Government infrastructure, the different middleware implementations being currently in use in Austria have oftentimes proven to be secure and to be able to meet given functional requirements. Unfortunately, in general there is a well-known trade-off between the security and the usability of IT solutions. Highly secure solutions usually tend to be less usable and vice versa (Schultz et al. 2001). Hence, it still can be observed that citizens often hesitate to actively use provided e-Government services due to lacking usability. We tried to find out the main reasons for this lack of user acceptance by conducting a usability analysis. The basic goal of this analysis was to measure and compare the usability and hence the efficiency of different Austrian middleware implementations in order to identify persisting weaknesses and to find out user preferences. Given the close correlation between usability and efficiency, the conducted usability evaluation has revealed interesting insights on the usability and efficiency of the assessed e-Government components. In this chapter we introduce the evaluated components of the Austrian e-Government infrastructure, discuss the followed methodology of the conducted usability test, and present obtained results.

The chapter is structured as follows. Section 4.2 discusses basic requirements of current e-Government applications and emphasizes existing trade-offs between security and usability. Subsequently, Sect. 4.3 introduces relevant concepts and components of the Austrian e-Government infrastructure. The methodology that has been followed to assess the usability of these core components is discussed in Sect. 4.6. Results of the conducted usability analysis are presented in Sect. 4.8. Finally, conclusions are drawn.

4.2 Requirements of E-Government Applications

Development and implementation of successful e-Government solutions are non-trivial tasks. Identification of critical success factors have been discussed for instance by Gil-Garcia (2007) and Altameem et al. (2006). If we focus on the development of

transactional e-Government applications that require remote interaction with citizens, then security, usability, and efficiency turn out to be key for success. We will discuss these three requirements, their relation to each other, and possible implications in the following in more detail.

4.2.1 Security

Security is crucial for most governmental and administrative procedures. If citizens go to a public office, e.g., to file an application, they usually have to prove their identity first by showing a valid identification document. Furthermore, citizens have to sign their applications in order to confirm that all data are correct and to preclude later repudiation. Reliable identification of citizens and handwritten signatures have been key concepts of governmental procedures for many years.

When such procedures are mapped to the digital world, the basic requirements remain the same. However, when using e-Government applications, citizens are not required to go to public offices any longer. Instead, they make use of their PC, laptop, or mobile device to carry out administrative procedures. Still, citizens need to be identified reliably and need to sign their applications to meet given security requirements.

The requirement for security in e-Government applications hence directly leads to the requirement for secure and reliable authentication mechanisms and to the requirement for a secure electronic pendant to handwritten signatures. Both requirements can be met by applying approved cryptographic methods such as two-factor authentication[2] schemes and qualified electronic signatures. We will discuss later how these methods are used in Austrian e-Government solutions to provide an appropriate level of security.

4.2.2 Usability

Usability is another key success factor of e-Government solutions that heavily influences user acceptance and that is closely related to efficiency (Frokjaer et al. 2000). Unfortunately, the demand for usability often conflicts with the demand for security. This problem has been discussed by Schultz et al. (2001). While an appropriate level of security requires the application of complex cryptographic methods and protocols, the increased complexity often significantly affects usability.

This dilemma is comparable to the problem regarding accessibility in e-Government applications that has been discussed by Orthacker and Zefferer (2011). The authors conclude that accessibility is crucial for e-Government

[2] Two-factor authentication defines an authentication approach requiring the presentation of two different authentication factors, e.g., something the user possesses (e.g., smart card) and something the user knows (e.g., password).

applications but is often difficult to achieve in practice due to limited implementation alternatives caused by given security requirements.

It is thus less surprising that usability is often neglected in current e-Government applications. This is problematic and potentially leads to scenarios in which e-Government applications can be used by expert and technical-affine users only. This phenomenon has become commonly known under the term *digital divide* (Norris 2003). To counter digital divide and to make e-Government solutions usable and efficient for all social and educational classes, usability has to be recognized as important requirement for efficient e-Government applications and solutions.

4.2.3 Efficiency

The basic goal of e-Government initiatives and solutions is to speed up governmental procedures to save time and costs. In this context, efficiency is of course an important aspect, since the efficiency of an e-Government solution is directly proportional to its potential to save money. However, the term efficiency can actually have different meanings for different stakeholders of e-Government solutions. Especially for citizens, usability is a key aspect of efficient e-Government solutions, as usable solutions provide more potential to save time when doing governmental procedures online. Since usable solutions are more likely to be frequently used by citizens, usability is also an important issue for governments providing e-Government solutions, which are willing to tap the full potential of their electronic services. Hence, usability, which has already been defined as key requirement above, is actually closely related to the requirement for efficiency (Chircu and Hae-Dong Lee 2005). Hence, when designing and implementing efficient e-Government solutions, usability definitely needs to be taken into account.

Considering the well-known trade-off between usability and security and taking into account the close relation between usability and efficiency, the integration of security-enhancing technologies into e-Government solutions can be a serious challenge in practice, which needs to be tackled.

4.3 e-Government in Austria: Concepts and Core Components

Security, usability, and efficiency have been defined as crucial requirements of e-Government solutions. It has been shown that there is a close correlation between efficiency and usability, while at the same time security and usability requirements are often contradictory. This section discusses the Austrian approach to cope with this situation and to meet all given requirements. For this purpose, basic concepts and core components of the Austrian e-Government infrastructure are briefly sketched in the following subsections.

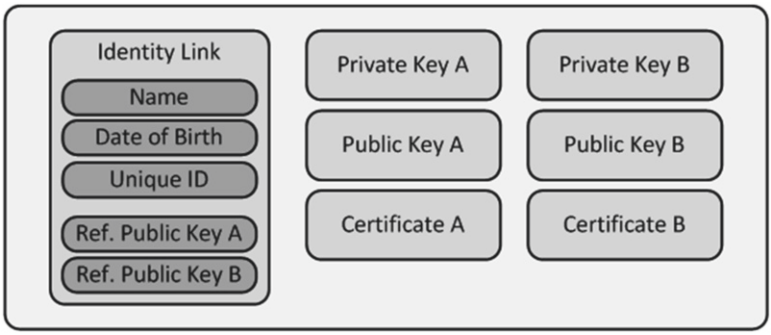

Fig. 4.1 Basic architecture of the Austrian Citizen Card

4.3.1 The Austrian Citizen Card Concept

The key concept of the Austrian e-Government infrastructure is called *Citizen Card* (*CC*). The CC is an abstract definition of a cryptographic token that allows citizens to securely authenticate at e-Government services and to create qualified electronic signatures. According to its specification (Hollosi et al. 2008), a CC securely stores cryptographic keys, which allow citizens to create qualified electronic signatures. Furthermore, a CC contains an XML-based data structure called *Identity Link*. The Identity Link itself contains—among others—the citizen's name, her unique ID, and references to the citizen's cryptographic public keys. This way, the Identity Link unambiguously links the citizen's identity with her personal cryptographic keys. Figure 4.1 summarizes the relevant components of the Austrian Citizen Card.

The CC concept perfectly meets the predefined security requirements. The identifier stored on the CC allows citizens to be unambiguously identified and authenticated at e-Government services. Since Austria is a member state of the European Union, the CC concept complies with the EU Signature Directive and fulfills all requirements of a SSCD. Thus, the CC allows citizens to create qualified electronic signatures that are legally equivalent to handwritten signatures.

Although the term Citizen Card might suggest the use of smart cards, the CC specifications are abstract and not limited to a certain technology. This flexibility has led to the development of different CC implementations during the past decade. These implementations can be classified into two categories. In *smart card-based approaches*, the CC is implemented by a smart card. For instance, Austrian citizens can use their health insurance card as CC. Alternatively, also bank account cards or smart card-based ID documents can be used as CC after an appropriate activation and personalization process.

Mobile approaches represent the second category of CC implementations. Mobile approaches render the use of smart cards unnecessary and make use of the citizen's mobile phone to achieve an adequate level of security. The Austrian Mobile Phone Signature, which is based on a concept that has been introduced by Orthacker et al. (2010), is the main representative of this category and currently in productive operation in Austria.

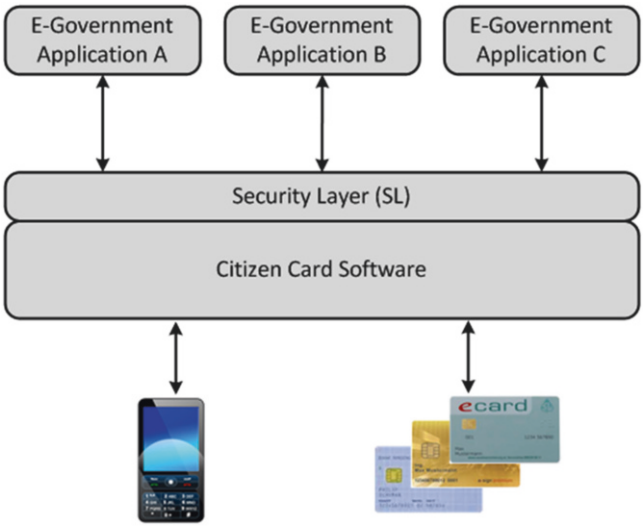

Fig. 4.2 Architecture of the Security Layer

4.3.2 Application Integration

Irrespective of the underlying technology, all CC implementations facilitate secure user authentication and creation of qualified electronic signatures in e-Government processes. The technology-neutral concept guarantees that each citizen can individually choose her preferred implementation.

Of course, this flexibility increases the complexity of application-development processes. In order to integrate CC functionality without preferring a particular solution, e-Government applications would need to support all available CC implementations. Also, the introduction of new CC implementations would cause significant maintenance costs for already deployed applications. In order to overcome this problem, the Austrian e-Government strategy follows a middleware-based approach.[3]

Figure 4.2 illustrates the basic architecture of this middleware approach. Central element is the so-called *Security Layer* (*SL*) interface, which has been introduced and discussed by Leitold et al. (2002). The Security Layer is an abstract XML-based interface that can be used by e-Government applications to easily access Citizen Card functionality. This way, applications do not need to integrate different and special CC implementations. Actually, applications do not even need to be aware of the used implementation, since all implementations can be accessed through a common interface. All implementation-specific functionality is outsourced to the

[3] In this context, a middleware constitutes an intermediary layer between the application and the underlying CC implementation. The middleware thereby hides CC-implementation specifics and provides easy access to CC functionality for the application.

so-called *Citizen Card Software* (*CCS*). The CCS implements access to specific CC implementations (e.g., smart cards) and provides their functionality through the common SL interface.

Acting as middleware between e-Government applications and CC implementations, the CCS plays a significant role in the Austrian e-Government infrastructure. This raises the question how the CCS can be implemented efficiently in practice. This question will be answered in the following subsections for smart card-based CC implementation approaches as well as for mobile CC implementation approaches.

4.4 CCS for Smart Card-Based Approaches

After introduction of the CC concept in Austria in 2002, smart card-based approaches have soon been available for citizens. First, smart cards following the CC specification have already been issued in 2002. Today, citizens can use their health insurance cards as CC for free, making this a popular smart card-based alternative.

The efficient implementation of CCS acting as middleware between smart cards and e-Government application is no trivial task and still subject to ongoing research. The most obvious approach is the use of software that has to be installed by citizens on their local computers. This approach is illustrated in Fig. 4.3. The locally installed software (i.e., the CCS) communicates with locally connected smart cards over the PC/SC[4] protocol and provides their functionality to e-Government applications through the standardized SL interface. Applications can access this interface through the citizen's Web browser and a local network socket that is opened by the CCS.

For many years, this approach has been the only available alternative. Still, local CCS solutions are offered by different vendors such as the Austrian certification

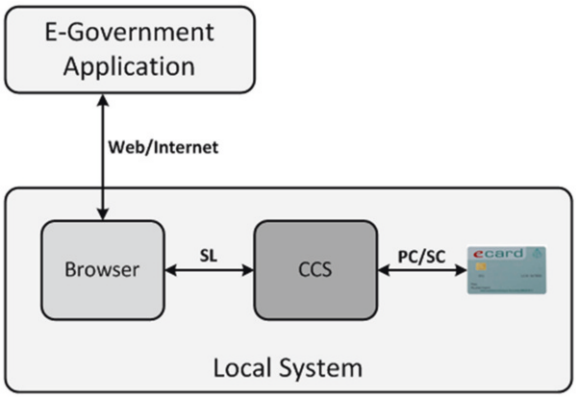

Fig. 4.3 Local Citizen Card Software (CCS) implementations

[4] http://www.pcscworkgroup.com

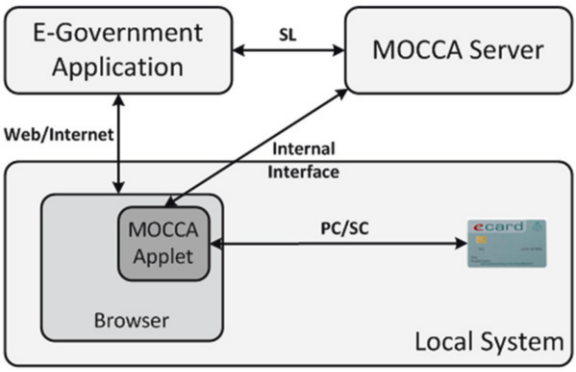

Fig. 4.4 General architecture of MOCCA Online

authority A-Trust[5] or the Austrian software company IT Solution.[6] The only open-source solution following the local approach is called *MOCCA Local*. The MOCCA (Modular Open Citizen Card Architecture) project[7] has been started in 2008 with the goal to provide open-source CCS solutions for Austrian citizens.

MOCCA Local features a minimalistic user interface and typically runs in the background. If access to a locally connected smart card is requested by an e-Government application, a small window pops up. Through this window, users are provided with relevant information (e.g., the data to be signed) and required user input (e.g., secure PIN to authorize the signature-creation process) is collected.

The local approach, which is shown in Fig. 4.3, works fine from a functional perspective. However, several years of field experience have revealed several drawbacks of this solution (Kubicek 2011). The main problem of this approach is the need to install the CCS on the local system. It turned out that this can be a severe problem especially for inexperienced users. Also, the need for a local software installation renders this approach infeasible in situations in which citizens do not have the required privileges to install software on the used system.

To overcome these problems, the MOCCA project has also investigated technical capabilities of an installation-free alternative. These efforts finally led to the development of *MOCCA Online*, an installation-free CCS. The basic architecture of MOCCA Online has been discussed in Centner et al. (2010) and is shown in Fig. 4.4. MOCCA Online follows a server-based approach. The SL interface is not implemented by locally installed software, but by the central MOCCA Server component. e-Government applications contact the MOCCA Server in order to access citizens' smart cards. Physical access to the locally connected smart card is implemented by a Java Applet running on the citizen's local system. MOCCA Applet and MOCCA Server together represent the CCS and communicate with each other through an internal interface. The MOCCA Applet is usually integrated in the Web front-end of

[5] http://www.a-trust.at/info.aspx?ch=2&lang=GE&node=733

[6] http://www.itsolution.at/trustDesk-basic.html

[7] https://joinup.ec.europa.eu/software/mocca/home

e-Government applications by means of an HTML IFRAME element. This way, the used Web browser can act as user interface for the provision of relevant information (e.g., the data to be signed) and the collection of required user input (e.g., PINs).

Since all required communication steps with locally connected smart cards are implemented by an automatically deployed Java Applet, no manual software installation is needed. The only requirement for the client system is availability of a current Java Runtime Environment (JRE).

Compared to local CCS approaches such as MOCCA Local, MOCCA Online is easier to use as it does not require any software installation. Unfortunately, local software installations are not the only barrier that can be identified for smart card-based solutions. For many citizens, the use of smart cards itself is already problematic as this requires appropriate reader devices.

4.5 CCS for Mobile Approaches

The goal to render smart cards completely unnecessary has been the main driver behind the development of mobile CCS solutions. In Austria, the so-called *Mobile Phone Signature*, which is based on a concept that has been discussed in 2010 by Orthacker et al. (2010), represents a mobile alternative to established smart card-based approaches. The general architecture of the Mobile Phone Signature is shown in Fig. 4.5.

Similar to MOCCA Online, a central service (Mobile Phone Signature Service) implements the SL interface. Instead of a smart card, a hardware security module (HSM) that is attached to this central service acts an SSCD. The HSM is capable of creating qualified electronic signatures on behalf of the citizen. To access CC functionality, e-Government applications send an appropriate request to the Mobile Phone Signature Service. Provision of the requested functionality (e.g., signature creation) or data (e.g., Identity Link) has to be authorized by the citizen. Therefore, the Mobile Phone Signature Service requests the citizen to enter her phone number and a secret password through a Web form. This Web form is usually integrated into e-Government applications by means of an HTML IFRAME element.

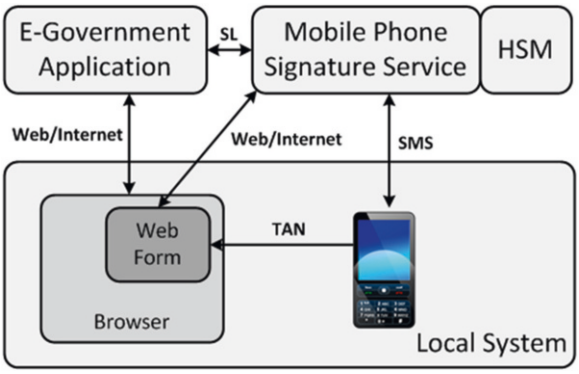

Fig. 4.5 General architecture of the Austrian Mobile Phone Signature

If the provided credentials can be verified correctly, an SMS message is sent to the citizen's mobile phone containing a one-time password[8] (TAN). This TAN has to be entered in the Mobile Phone Signature Service's Web form to authorize execution of the e-Government application's request.

The main advantage of this mobile approach is the central HSM, which renders smart cards unnecessary. By relying on a strong two-factor authentication scheme that makes use of two separated communication channels (i.e., Web and SMS), a sufficient level of security is assured.

4.5.1 Usability Considerations

The importance of usability—also as criterion for measuring efficiency—in e-Government has been subject to ongoing research for many years. However, most work has focused on the usability of e-Government Web sites so far. For instance, a quality inspection method for the evaluation of e-Government sites has been proposed by Garcia et al. (2005). In Ma and Zaphiris (2003), the authors have evaluated the usability of different e-Government Web sites in the UK. Recently, also the usability of Norwegian e-Government Web sites has been discussed by Sørum (2011).

Without doubt, usability of e-Government Web sites is an important topic. However, integration of security-enhancing technologies such as smart cards into Web-based e-Government applications definitely needs to be considered as well. Otherwise, usability evaluations of current e-Government solutions threaten to remain incomplete and to miss relevant aspects.

According to the Austrian e-Government strategy, security-enhancing technologies are integrated into e-Government applications by means of different CCS implementations. Currently, MOCCA Local, MOCCA Online, and the Austrian Mobile Phone Signature represent frequently used implementations of Citizen Card Software. We have assessed the usability of these three components to identify persisting usability problems and to analyze user preferences in order to further improve the efficiency of the Austrian e-Government. Details of the conducted usability test are provided in the next section.

4.6 Methodology

A usability test has been conducted to assess the usability and to measure the efficiency of the three CCS implementations that have been introduced in the previous section. In this section, relevant aspects of the methodology that has been followed

[8] A one-time password constitutes a password which is valid for one transaction or one login only.

for the conducted usability test are discussed. We define research questions to define the scope of the conducted usability test first. In the following, we present the applied test method and introduce the used test setup. Finally, we discuss the concrete design of the conducted test and discuss details regarding the selection and classification of test users.

4.6.1 Research Questions

The general goal of this empirical study was to find out which CCS implementation model is favored by Austrian citizens to further improve usability and efficiency in e-Government services. This investigation was based on a thorough usability analysis of the individual CCS implementations. The usability of MOCCA Local, MOCCA Online, and Mobile Phone Signature has been assessed by means of the following research questions. By answering these research questions, we attempted to find out whether the different CCS implementations satisfy usability requirements and are able to achieve an appropriate level of user acceptance:

Q1. Do required software installations represent a barrier and reduce usability?
Q2. Does reliance on Java-based solutions cause any additional usability issues?
Q3. How do users rate the overall usability of MOCCA Local, MOCCA Online, and the Mobile Phone Signature?
Q4. How do users rate the security and trustworthiness of MOCCA Local, MOCCA Online, and the Mobile Phone Signature?
Q5. Which CCS implementation variant do users prefer in general?

To answer these questions, a usability test has been conducted. Details of the applied test method and the used test setup are provided in the following section.

4.6.2 Test Method and Setup

We have applied a thinking-aloud test with 20 test users to evaluate the usability of different Austrian CCS implementations. We have chosen this number of test users, as this is a sufficiently large number to produce reliable and meaningful results (Nielsen 2013). The basic test run was identical for all 20 test users and consisted of the following four phases.

P1. Welcome: Test users have been welcomed, have been provided with relevant information about the usability test, and have been asked to sign a nondisclosure agreement.
P2. Background questionnaire: At the beginning of the usability test, relevant information about the participating test user has been collected using a prepared questionnaire.

P3. Execution of tasks: In this phase, test users have been asked to carry out a sequence of well-defined tasks using the three CCS implementations to be evaluated. After each task, the test user has been asked to fill out a prepared questionnaire and to rate the tested component (post-task rating).
P4. Conclusive interview: After completion of all tasks, a conclusive interview has been conducted with the test users. After the interview, test users have been asked to fill out a final questionnaire (post-study rating) covering some general questions.

During Phase P3, test users have been asked to carry out predefined tasks using an off-the-shelf desktop PC. In order to use a common configuration, all tests have been carried out using the *Microsoft Windows 7* operating system and *Microsoft Internet Explorer* 8 Web browser. The desktop PC was equipped with a *Reiner* SCT card reader device. Test users were not allowed to use other system configurations (e.g., a different Web browser) as this would have rendered direct comparisons between test users difficult.

The used test system was equipped with Morae Recorder software.[9] The use of this software allowed tracking and recording of user sessions including all user activities such as mouse movements and keyboard inputs. Additionally, comments and facial expressions of test users have been recorded with a Web cam and stored together with the recorded user session for later analysis. To be able to record all user comments during Phases P2 and P4, we have additionally used a standard camera to record the entire test.

The filled questionnaires have represented the most important data sources for later analysis. To obtain as much valuable feedback as possible, we relied on semantic differentials. The method of semantic differentials has been discussed by Boslaugh and Watters (2008) and is frequently used in social sciences and user-experience research. In general, semantic differentials are used to measure the connotative meaning of an object and to further derive the attitude towards this object. We used semantic differentials to allow users to assign weighted properties to the evaluated software components.

Besides the filled questionnaires, also the recorded user sessions and user comments have been incorporated in the analysis process. These data have turned out to be extremely helpful in order to understand the collected user feedback and to identify reasons for negative ratings. Obtained results of the evaluation process will be presented in Sect. 4.8.

4.6.3 Tasks

Most relevant information has been collected during Phase P3 of the usability test, i.e., during the execution of predefined tasks. We have defined these tasks such

[9] http://www.techsmith.com/morae.html

that answers to the predefined research questions could be derived easily from the collected data. All test users have been asked to carry out five tasks. For these tasks we have set our focus on the typical standard use case within the Austrian e-Government. This includes the installation process of the required software for the Citizen Card Software MOCCA Local and MOCCA Online, the activation of the Mobile Phone Signature, and using a typical demo e-Government application[10] with these three CCS implementations. A valid smart card-based Citizen Card was the only prerequisite for test users. In the following we elaborate on the tasks related to the smart card-based and mobile phone-based CCS implementations.

Tasks related to the smart card-based CCS implementations MOCCA Local and MOCCA Online:

T1. Install the Citizen Card Software MOCCA Local on the local system.
T2. Use MOCCA Local to file a demo e-Government application.
T3. Use MOCCA Online to file a demo e-Government application.

MOCCA Local and MOCCA Online are Java-based solutions. To cover all possible real-life scenarios, the used test system has been provided without a JRE. The JRE had to be installed by the test user during the test run. Both MOCCA Local and MOCCA Online automatically check for an installed JRE upon start-up and guide users through the Java installation process if no JRE is found on the local system. In order to be able to evaluate the usability of this functionality for both MOCCA variants, we split the test users randomly into two groups. Group A started with Task T1 as shown above. Hence, this group had to install Java during the installation process of MOCCA Local. In contrast, Group B was asked to start with Task T3 followed by T1 and T2. This way, users of this group had to install Java during the first use of MOCCA Online.

By splitting test users into two groups, we were able to directly compare the integration of the Java installation process into MOCCA Local and into MOCCA Online. Furthermore, we were able to cancel out learning effects that would otherwise have biased obtained results.

After completing T1–T3, the users had to execute the following tasks related to the Mobile Phone Signature:

T4. Use your smart card-based Citizen Card to activate the Mobile Phone Signature for your mobile phone.
T5. Use the Mobile Phone Signature to file a demo e-Government application.

The activation of the Mobile Phone Signature can be done by users themselves, using an existing smart card-based Citizen Card. Hence, the only prerequisite was to have a valid smart card-based Citizen Card and having a smart card-based CCS implementations installed.[11]

[10] This typical demo e-Government application consists of filling out a form and signing it (using a CCS) afterwards.

[11] Therefore, the test users have been requested to execute Tasks T1, T2, and T3 beforehand.

4.7 Test Users and User Group

The usability test has been conducted with 20 test users in total. According to Nielsen (2013), this is a sufficient number of test users to obtain reliable results. In order to obtain meaningful results, we have selected a representative sample of the Austrian population for our test.

As explained above, test users have been randomly assigned to two different user groups. Depending on the assigned group, test users have been asked to execute the predefined tasks in a different order. While the assignment of users to Group A and Group B was completely random, users have additionally been assigned to different user groups according to several personal characteristics. This way, we have split test users according to their age, education, and technical experience. Table 4.1 lists all predefined user groups.

4.8 Results

The goal of the conducted usability test was to answer the five research questions defined in the previous section. Results of the conducted usability test and answers to these research questions are presented and discussed in this section.

4.8.1 Usability of Installation-Based CCS

To answer Research Question Q1, we assessed whether the required installation process of MOCCA Local represents a barrier for users and hence reduces the usability of local CCS implementations. To install MOCCA Local using Java Webstart[12] technology, test users had to navigate to a given Web site and click a "Launch" button. After that, test users were asked to manually install a certificate into the used Web browser.

Table 4.1 User groups

Group ID	Description	Users
Group ALL	This group comprises all test users	20
Group A	Users of this group started with Task T1	10
Group B	Users of this group started with Task T3	10
Group 30+	Users of this group were more than 30 years	8
Group 30−	Users of this group were 30 or less years old	12
Group U	Users of this group had a university degree	12
Group NU	Users of this group had no university degree	8
Group T	Users of this group had a technical education	7
Group NT	Users of this group had no technical education	13

[12] http://www.oracle.com/technetwork/java/javase/tech/index-jsp-136112.html

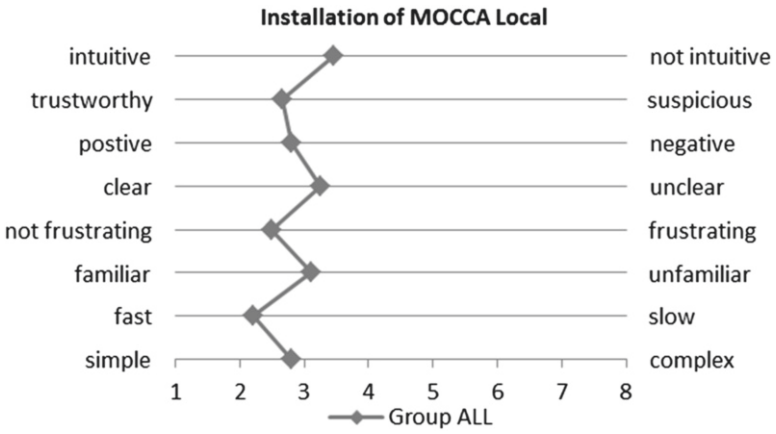

Fig. 4.6 Evaluation results of the installation process of MOCCA Local

Figure 4.6 shows that in general most test users rated the installation process positively. This corresponds to the observations that have been made during the test runs. Most users were able to successfully complete the installation on their own.

A user group-specific analysis yielded several interesting results. For instance, it turned out that users of Group B rated the installation process of MOCCA Local better than users of Group A. This is probably due to the fact that users of Group B already had the chance to gain experience with another CCS implementation, i.e., MOCCA Online, before.

Also the educational level of users has influenced the rating of the installation process. University graduates rated all aspects of the installation process more positively than nongraduate users. An analysis of the recorded user sessions revealed that especially the required certificate installation was problematic for those users. The reason is probably that the use of digital certificates is not well known to technically inexperienced users. However, this step is not directly related to the CCS implementation.

Interestingly, neither the age nor the technical background of users has influenced the obtained results significantly. Details of group-specific results are illustrated in Fig. 4.7. To answer Research Question Q1, we can conclude that a required software installation process does not raise severe usability issues. Still, installation routines should be simple and intuitive in order to make this a feasible task also for inexperienced users.

4.8.2 Usability Issues of Java-Based Approaches

In order to answer Research Question Q2, we tried to find out whether reliance on Java-based approaches raised any usability issues. Since both MOCCA Local and MOCCA Online represent Java-based solutions, test users had to install Java either

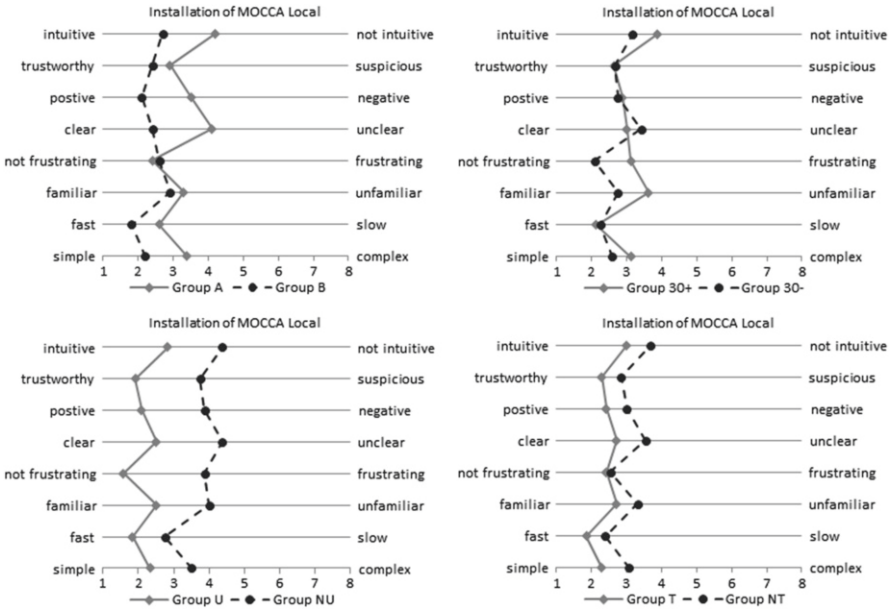

Fig. 4.7 Group-specific evaluations of the installation process of MOCCA Local

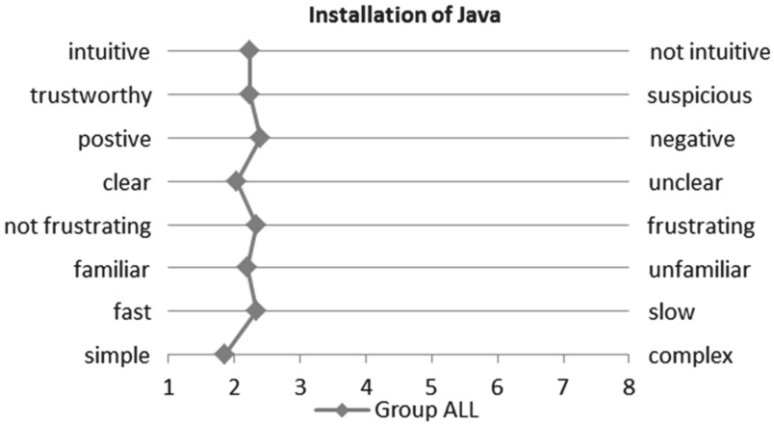

Fig. 4.8 Evaluation results of the Java installation process

during the installation of MOCCA Local (Task T1) or during the first usage of MOCCA Online (Task T3), depending on the assigned user group. The conducted usability analysis revealed that hardly any user had problems with the Java installation process. Therefore, the Java installation process and its integration into MOCCA Local and MOCCA Online have been rated positively by most users. Figure 4.8 illustrates these results.

The user group-specific analysis again yielded interesting results. We expected users without technical background and with higher age to have more problems

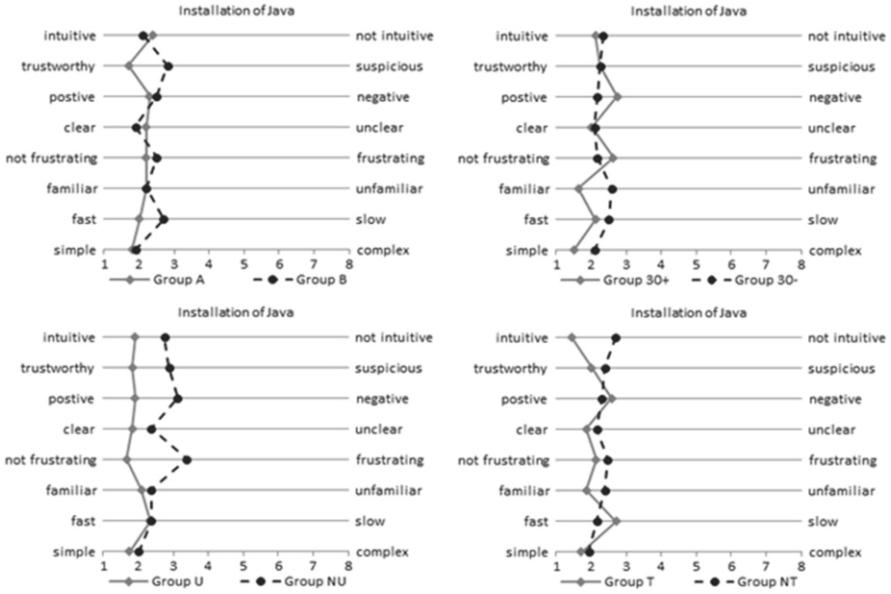

Fig. 4.9 Group-specific evaluation of the installation process of Java

with the Java installation process. Hence, we expected worse ratings from these user groups. However, the obtained results have shown that there are only marginal differences between these user groups. Again, users with a university degree rated the Java installation process more positively than nongraduate users. Details of the obtained user group-specific results are illustrated in Fig. 4.9.

To answer Research Question Q2, we can conclude that reliance on Java does obviously not raise significant usability issues. Most users had no problems to start and complete the Java installation process on their own. Surprisingly, Java was well known to virtually all test users. Analysis of the recorded user sessions revealed that most problems were encountered right after the installation process. Users were left on the Java Web site after the installation process and not automatically redirected back to MOCCA Local or MOCCA Online, respectively. This caused confusion with some test users. Although this has not significantly affected the overall rating of the Java installation process, this issue should be addressed.

4.8.3 Usability of Different CCS Implementations

According to Research Question Q3, we have analyzed how MOCCA Local, MOCCA Online, and the Mobile Phone Signature have been rated by the test users. Test users have been asked to file a demo e-Government application using their Citizen Card and each of the three evaluated CCS implementations as defined by Tasks T2, T3, and T5. We discuss obtained results for the three CCS in the following subsections.

4.9 Evaluation of MOCCA Local

Figure 4.10 shows that in general the use of MOCCA Local has been rated positively by all test users. This corresponds to the observations that have been made during the test runs. Most test users were able to complete the assigned task using MOCCA Local without any problems.

Comparison of the results obtained for Group A and Group B yielded interesting results. The use of MOCCA Local has been rated more positively by test users of Group B. This is probably due to learning effects. Test users of Group B started with the evaluation of MOCCA Online. Hence, these users were already more familiar with the handling of their Citizen Card than test users of Group A, who started directly with the evaluation of MOCCA Local.

Significant differences could again be identified between graduate and nongraduate test users. Again, ratings from nongraduate users were more negative than ratings from graduate users. The user's technical background had a similar impact on the user ratings. However, differences between users with technical background and users without technical background were not as significant as between graduates and nongraduates. Contrary, the user's age had no significant impact on the rating of MOCCA Local. Details of group-specific results are provided in Fig. 4.11.

4.10 Evaluation of MOCCA Online

Similar to MOCCA Local, also the use of MOCCA Online has been rated predominantly positive. Figure 4.12 illustrates the obtained results. Again, most users were able to complete the assigned task and to file a demo e-Government application using MOCCA Online on their own.

The group-specific analysis revealed that this time users of Group A provided more positive ratings than users of Group B. This result supports the theory that

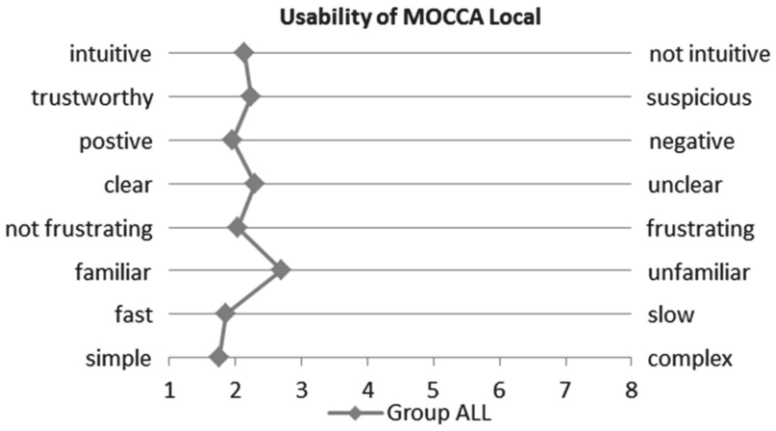

Fig. 4.10 Usability evaluation results of MOCCA Local

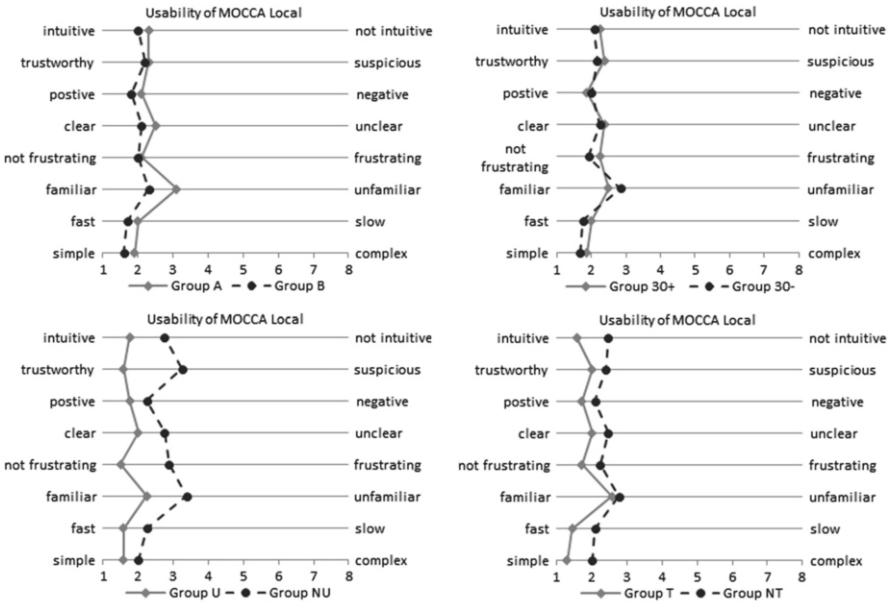

Fig. 4.11 Group-specific evaluation of MOCCA Local user experience

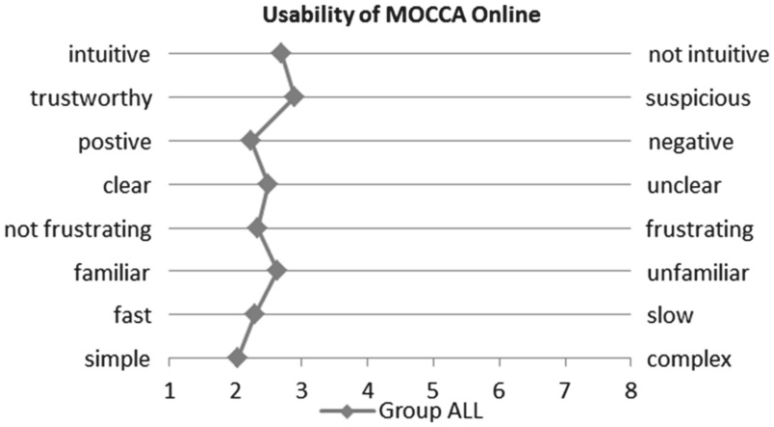

Fig. 4.12 Usability evaluation results of MOCCA Online

gained experience and learning effects influence user ratings. Again, users, who had already evaluated MOCCA Local before, rated MOCCA Online better.

Analysis of other group-specific results yielded interesting results. Surprisingly, users with technical background rated the use of MOCCA Online less positively than non-technicians. Significant differences in the obtained results could also be observed between graduate and nongraduate users. Again, nongraduates rated MOCCA Online less positively in most aspects. Details of obtained group-specific results are provided in Fig. 4.13.

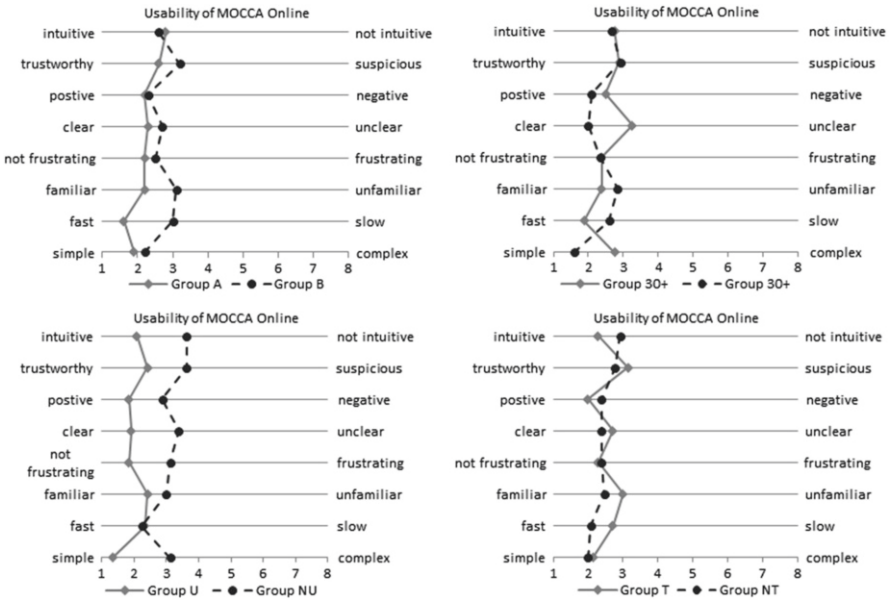

Fig. 4.13 Group-specific evaluation of MOCCA Online use

4.11 Evaluation of the Mobile Phone Signature

Test users were also asked to file a demo e-Government application using their mobile phone and the Austrian Mobile Phone Signature and to rate the usability of this approach. Figure 4.14 shows that also the use of the Mobile Phone Signature has been rated mainly positively.

Comparison of group-specific results shows that again graduate users rated the usability more positively that nongraduates. This time, no significant differences could be observed between the results of Group A and Group B. This is comprehensible, since both groups have evaluated the Mobile Phone Signature after using MOCCA Local and MOCCA Online. Thus, users of both groups had the same level of experience before testing the Mobile Phone Signature.[13] Group-specific results are provided in Fig. 4.15.

[13] Note that we were forced to schedule the evaluation of the Mobile Phone Signature after evaluation of the two smart card-based CCS implementations. This was due to the fact that the activation process of the Mobile Phone Signature was part of the usability test (Task T4). Since the activation process required a Citizen Card-based user authentication, either MOCCA Local or MOCCA Online was required to activate the Mobile Phone Signature.

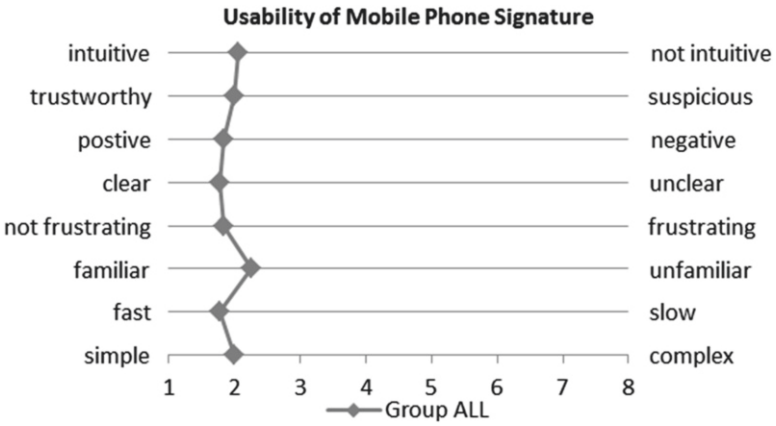

Fig. 4.14 Usability evaluation results of Mobile Phone Signature

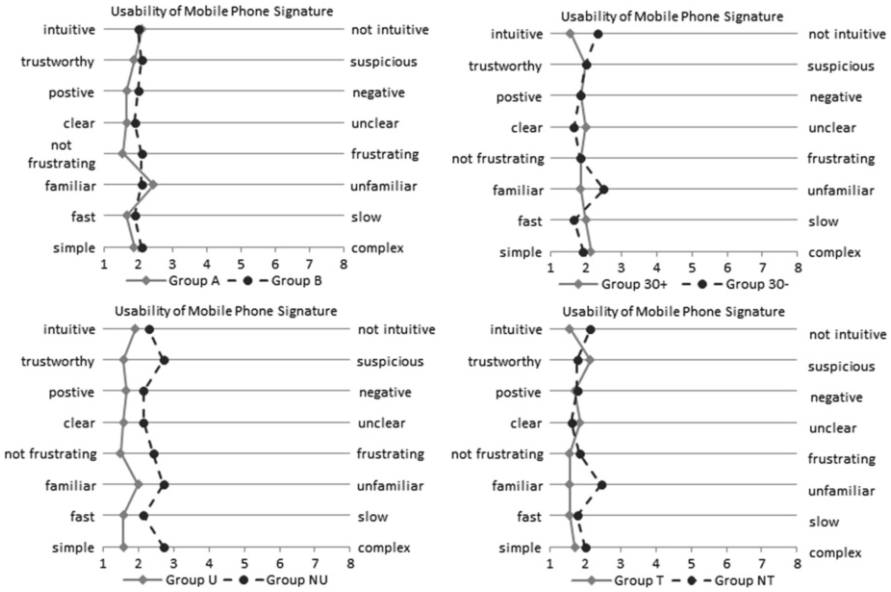

Fig. 4.15 Group-specific evaluation of Mobile Phone Signature

4.12 Comparison of Different CCS Implementations

A direct comparison of the obtained ratings for all three CCS implementations is shown in Fig. 4.16. In total, the usability of the Mobile Phone Signature has been rated best, followed by MOCCA Local.

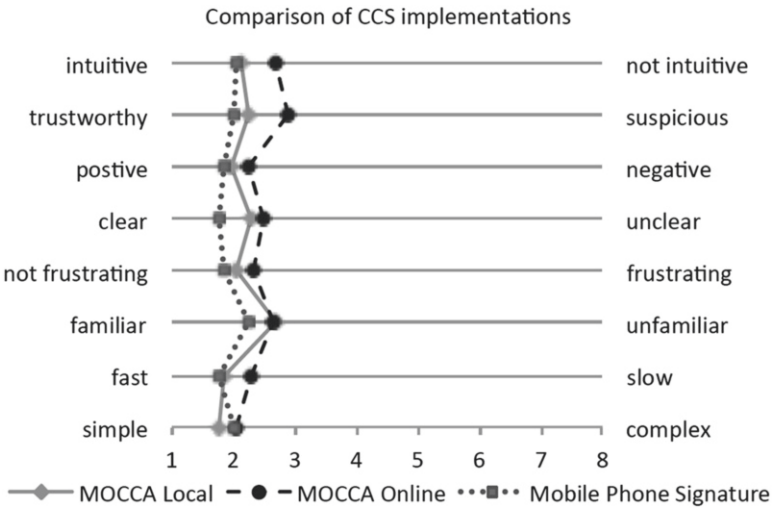

Fig. 4.16 Comparison of different CCS implementations

In order to answer Research Question Q3, we can conclude that the usability of all three CCS implementations has been rated positively. Significant differences can be mainly identified between graduate users and nongraduates. The latter have rated all three CCS implementation less positively. In total, the Austrian Mobile Phone Signature has achieved the best results and thus seems to be the favored solution for Austrian citizens.

4.12.1 Security and Trustworthiness

Besides usability, the security and trustworthiness of used components is crucial for the acceptance of e-Government solutions. According to Research Question Q4, we have analyzed whether the three evaluated CCS implementations appear secure and trustworthy for users. To answer this question, test users have been asked to rate the perceived level of security and trustworthiness for all three CCS implementations. The ratings have been collected by means of a questionnaire.

Figure 4.17 illustrates the obtained results for MOCCA Local. In general, the majority of users rated MOCCA Local to be secure and trustworthy. Only few test users assumed this CCS to be insecure and not trustworthy at all. Users of Group B rated the security and trustworthiness of MOCCA Local more positively than users of Group A. Younger test users regarded MOCCA Local with more suspicion than older users. Also nongraduate users turned out to be slightly more skeptical than graduates. Similar differences could be observed between technicians and users without technical background. The latter regarded MOCCA Local with more suspicion than technically experienced users.

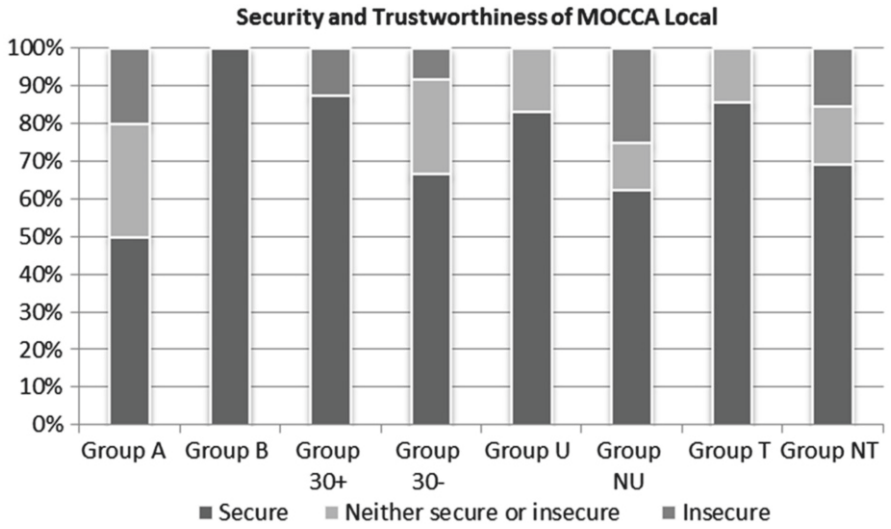

Fig. 4.17 Perceived security and trustworthiness of MOCCA Local

Analysis of the recorded user sessions and of information extracted from the conducted interviews revealed the main reasons for potential suspiciousness. As explained above, users were asked to install a certificate in the used Web browser during the installation process of MOCCA Local. This is necessary in order to establish an appropriate trust relationship between the Web browser and MOCCA Local. Unfortunately, the trust status of the used certificate was not accepted by the used Web browser. Hence, test users were faced with a security warning during the installation of this certificate. While most users simply ignored it, some test users were unsettled by the shown security warning.

Compared to MOCCA Local, MOCCA Online received worse ratings regarding security and trustworthiness. Obtained results are illustrated in Fig. 4.18. This time, similar results could be obtained for Group A and Group B. Again, older test users rated the security and trustworthiness of MOCCA Online more positively than younger users. Worst ratings have actually been obtained from nongraduate users. Less than 40 % of nongraduates rated MOCCA Online to be secure and trustworthy. No significant differences could be observed between technicians and users without technical background.

Similar to MOCCA Local, suspiciousness was mainly caused by shown security warnings. Since the Java Applet of MOCCA Online accesses local resources (i.e., the user's smart card), the Applet needs to be signed. Again, the trust status of the signing certificate was not accepted by the used Web browser.[14]

[14] This was due to the fact that a test instance of MOCCA Online has been used during the tests. The Java Applet of this test instance was signed with a test certificate only.

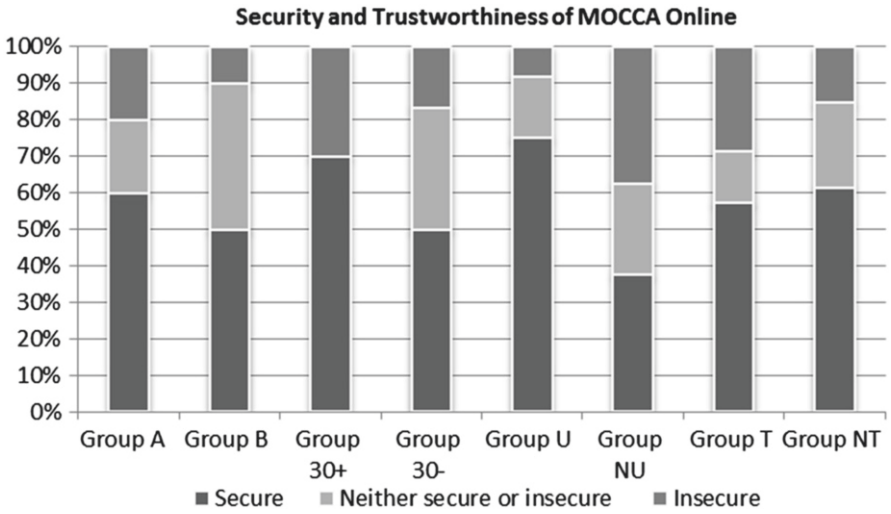

Fig. 4.18 Perceived security and trustworthiness of MOCCA Online

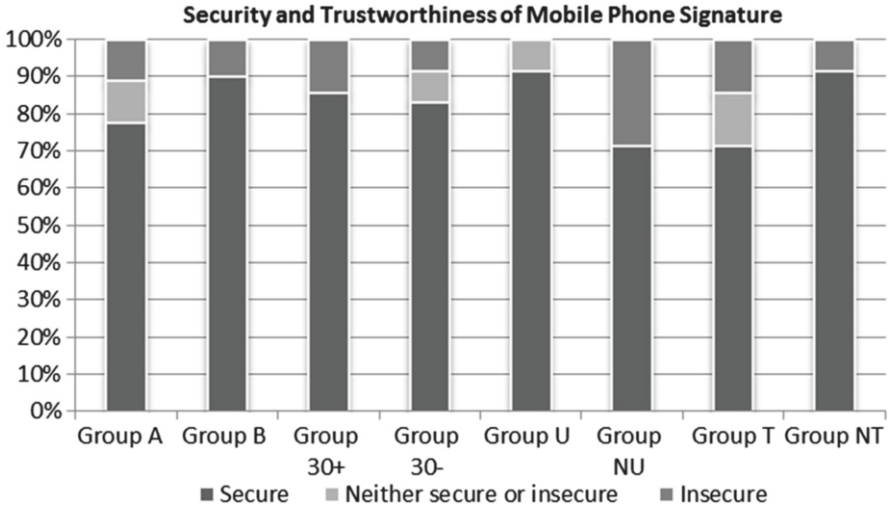

Fig. 4.19 Perceived security and trustworthiness of Mobile Phone Signature

Hence, a security warning was shown during the loading of the Applet. Some users were unsettled by this security warning.

In comparison to the two smart card-based CCS implementations MOCCA Local and MOCCA Online, the Mobile Phone Signature obtained significantly better ratings. Results are illustrated in Fig. 4.19. In all user groups, more than 70 % of the test

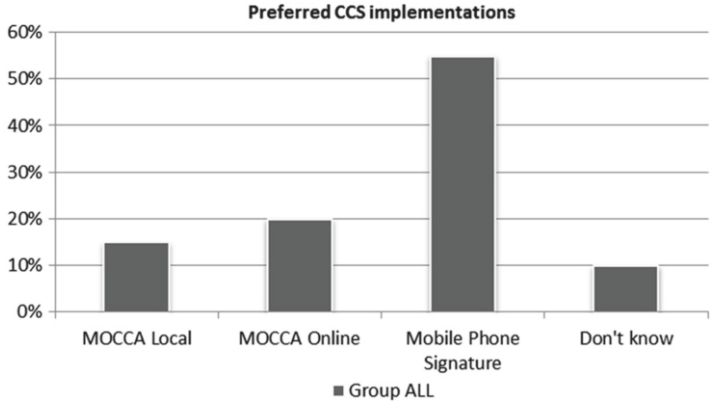

Fig. 4.20 Preferred CCS implementation

users rated the Mobile Phone Signature to be secure and trustworthy. Most significant differences in group-specific results could again be observed between graduates and nongraduate users. Also users without technical background rated the security and trustworthiness of the Mobile Phone Signature significantly better than technicians.

To answer Research Question Q4, we can conclude that users attested all three CCS implementations an appropriate level of security and trustworthiness. Still, there is some room for improvement especially for smart card-based approaches. A direct comparison of the three CCS implementations shows that the Mobile Phone Signature appears to be the most secure and trustworthy solution, followed by MOCCA Local and MOCCA Online.

4.12.2 Personal Preferences

Personal preferences of the individual test users have been identified in the course of the conducted conclusive interviews. All test users have been asked whether they will continue to use their Citizen Card for private affairs and which of the three tested CCS they will use.

Obviously, most test users have been convinced of the Citizen Card and stated to use it in the future for e-Government procedures. Regarding the preferred CCS, the Mobile Phone Signature has turned out to be the favored alternative. Figure 4.20 illustrates the obtained results. The Mobile Phone Signature has been selected by more than 50 % of all test users to be the favored alternative. 20 % of the test users stated that MOCCA Online is their preferred CCS. For approximately 15 % of all test users, MOCCA Local is the favored implementation alternative.

Again, interesting results can be obtained by comparing different user groups. While no major differences could be identified between users of Group A and Group B,

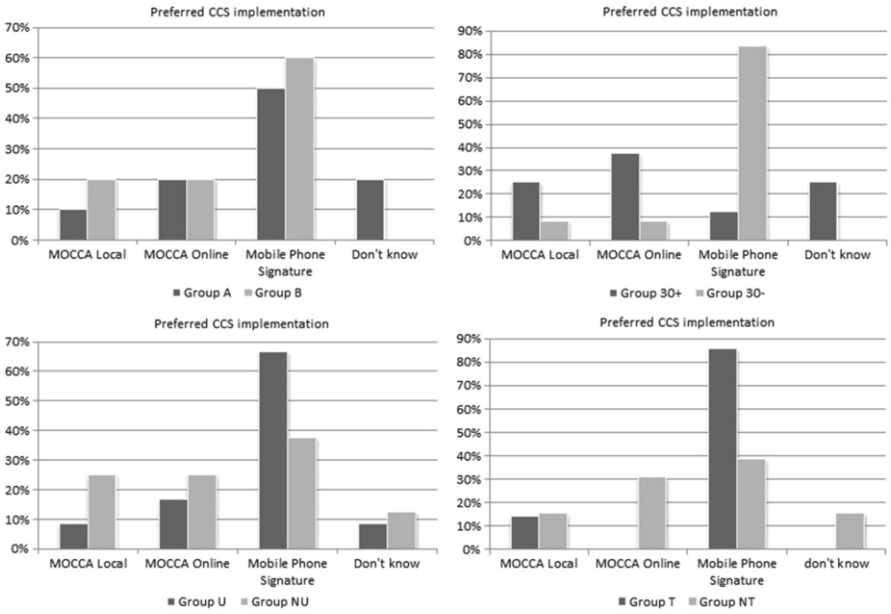

Fig. 4.21 Group-specific preferred version of CCS

the user's age obviously influenced the choice of the preferred CCS significantly. In the group of users being 30 or more years old, only about 10 % selected the Mobile Phone Signature as favored CCS alternative. In this group, most users preferred MOCCA Online. Even MOCCA Local achieved a higher acceptance than the Mobile Phone Signature in this group. In contrast to that, in the group of users being younger than 30, more than 80 % of all test users favored the Mobile Phone Signature, while the two smart card-based CCS implementations were favored by less than 10 % only.

Significant differences could also be observed between graduate test users and nongraduates. In both groups, the Mobile Phone Signature was the favored choice. However, while in the graduate group the Mobile Phone Signature was the clear winner, results were less unambiguous in the group of nongraduate test users. Similar results could be observed between technicians and users without technical background. Technicians clearly preferred the Mobile Phone Signature. This was also the favored choice of users without technical background. However, results were less unambiguous in this user group. All group-specific results are illustrated in Fig. 4.21.

In order to answer Research Question Q5, we can conclude that the Mobile Phone Signature is definitely the favored CCS implementation for citizens. This especially applies to young and well-educated people. Also users with a technical background clearly prefer the mobile CCS implementation variant.

4.13 Conclusions

The goal of this work was to evaluate the usability of several core components of the Austrian e-Government infrastructure, namely, different CCS implementations, in order to measure their efficiency. In total, five research questions have been defined to cover relevant usability aspects and to clearly define the scope of this work. To find answers to these questions, a thinking-aloud test has been conducted with 20 test users in total.[15] By analyzing the data that had been collected during these tests, we were able to find appropriate answers to all previously defined research questions.

Obtained results show that most recent developments have positively influenced the usability of Austrian e-Government processes. For instance, results show that reliance on Java technology does not raise severe usability problems. Hence, we can conclude that it was the right decision to base most Austrian e-Government components on Java. While it allows for platform-independent solutions, Java technology does not cause any severe usability problems for the evaluated solutions.

As shown in Figs. 4.17 and 4.18, the usability, security, and trustworthiness of MOCCA Online has been rated slightly worse compared to MOCCA Local. However, more users finally stated to personally prefer MOCCA Online to MOCCA Local. Obviously, the required software installation process of MOCCA Local is the decisive argument for users to rely on the installation-free alternative provided by MOCCA Online.

While MOCCA Local and MOCCA Online obtained comparable ratings in most categories, the Mobile Phone Signature turned out to be the clear winner in terms of popularity, security, trustworthiness, and usability. As depicted in Fig. 4.21, especially young and well-educated users clearly preferred the Mobile Phone Signature over smart card-based approaches. Hence, we can conclude that reliance on mobile technologies and solutions was the right decision and that this strategy appears to be promising also for future developments. This conclusion is consistent with the findings of Hung et al. (2013).

The conducted usability test delivered deeper insight into the usability of core components of the Austrian e-Government from the citizens' point of view. By collecting user feedback via various questionnaires, we were able to identify persisting weaknesses and further room for improvement. Valuable findings have also been obtained from an analysis of recorded user sessions. All results will be incorporated into future releases of the three evaluated CCS implementations. Thus, the conducted usability test contributes to the future security and usability of MOCCA Local, MOCCA Online, and the Mobile Phone Signature and hence to more efficient e-Government services.

[15] According to Nielsen (2013), a group of five people is fully sufficient for such tests (this number has been also reached for each subgroup of the test users).

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Chapter 5
Electronic Government Service Efficiency: How to Measure Efficiency of Electronic Services

Lasse Berntzen

Abstract This chapter discusses efficiency of e-Government services. How is it possible to measure efficiency of e-Government services? The key message is that e-Government service efficiency should be assessed both from the user perspective and the administration perspective. Current literature is examined, and a set of indicators is proposed together with a methodology to use these indicators to calculate the efficiency gain of using electronic services, both from citizen/business perspective and administration perspective. Two different approaches are presented. The first approach requires collection of quantitative data from both users and the administration and calculates the efficiency gain. The second (lightweight) approach is less rigorous but still useful to prioritize between different services.

5.1 Introduction

This chapter presents research on e-Government service efficiency performed as part of the eGovMon project. The project worked with government agencies and municipalities to find indicators and develop measurement techniques to assess the following aspects of e-Government web sites and services: accessibility, transparency, efficiency, and impact. To assess accessibility and transparency, the eGovMon project has produced tools for automatic and semiautomatic assessment. To assess efficiency and impact, the project has developed measurement techniques based on indicators. The goal was to improve benchmarking of web sites and services.

This chapter focuses on efficiency of e-Government services.

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Public Administration and Information Technology 5, DOI 10.1007/978-1-4614-9982-4_5,

5.1.1 Public Sector Efficiency

There is a vast amount of research on public sector efficiency (Sørensen 2009). This research has mostly been motivated by the changes in attitude towards the public sector (Le Grand 2003). People are more skeptical towards the public sector, and at the same time citizens want more freedom of choice and more influence on public service production. Research has been conducted on such themes as models of ownership (Ramsdal and Skorstad 2004), different ways of governing and financing public sector activities (Johnsen 2007), and the impact of different leadership models (Schedler and Proeller 2010).

In Norway, the debate on public sector efficiency was significantly intensified in 1989 with the establishment of a national steering committee to analyze the possible efficiency gains in the public sector. This steering committee initiated studies within a number of different areas, which were completed during the summer and autumn of 1990. Based on the results, the steering committee initiated a study of the total potential for efficiency gains and appointed an expert group headed by Prof. Victor D. Norman to undertake this task. The expert group submitted their report on April 7, 1991 (NOU 1991:28). This report had focused on efficiency of the entire public sector. Since then, efficiency improvements have been the goal of Norwegian governments regardless of political orientation.

5.1.2 e-Government Service Efficiency

While research on public sector efficiency is widespread, research on the efficiency of electronic services is almost nonexistent. There are some examples of research on efficiency related to electronic commerce (Watson et al. 2000), which have been adapted to e-Government services (Steyaert 2004). This research will be described in further detail in the next section.

Lu and Rao (2008) built a framework for assessing e-service export performance. Their paper looks at e-services as opportunities for export and categorizes e-services based on the degree of customization and the degree of tangibility. The development of the framework draws on resource-based theory (RBT) and identifies six propositions that influence success: firm resources, management commitment, product adaption, e-service type, firm size, and export experience. While not directly relevant to development of eGovMon indicators on efficiency, the paper contains some valuable insight on how to build successful e-services.

Auer and Petrovic (2004) discussed performance of electronic services in general. They introduced the perspectives of the user and the provider. Their paper proposes a three-phase model for measuring e-service performance, shown in Table 5.1.

While this research is not directly relevant to the development of efficiency indicators for e-Government services, the ideas presented have influenced the work, in particular the idea of including both the user (citizen or business) and provider (administration) perspectives.

Table 5.1 Integrated e-service performance measurement methodology (Auer and Petrovic 2004)

Phase	Objectives	Results
Phase 1: user process integration	Analyzing the processes of the user	Relevant user key performance indicators (KPIs)
	Estimating the benefits and costs for the e-service user	Documented user processes
	Developing relevant key performance indicators for the user and trust perspective	
Phase 2: e-Service scorecard	Collecting all relevant company data	Key performance indicators for all value perspectives
	Estimating the values and costs for the e-service provider	e-Service cost indicators
	Developing relevant key performance indicators for the provider perspectives	
Phase 3: investment simulation and controlling	Estimating target values for the cost and performance indicators	Investment decision support
	Comparing various utilization and cost scenarios	Controlling system for e-services
	Controlling and adjusting the target values	Organizational learning through simulation of events
	Continuous improvement of the measurement process and the e-service offering	

5.1.3 The Aim of This Chapter

The aim of this chapter is to present a framework to measure efficiency of e-Government services. In order to measure, it is necessary to find a suitable set of indicators based on data collected in various ways.

It is important to look at service efficiency both from the user (citizen/business) perspective and the administration perspective.

Most studies discussing public sector efficiency have considered the administration perspective only, where efficiency gain can be seen as a reduction of cost (or labor) related to the provision of the service (e.g., NOU 1991:28) (Kalb 2010). However, it may be even more important to look at efficiency from the user (citizen or business) perspective, since this user-centric approach has more impact on how citizens or businesses perceive the government. How does e-Government save time and effort for the user of the service? In previous work of the eGovMon project, the interests of the users (accessible and transparent public web sites) have been focused. It was therefore natural to keep this user-centric approach when discussing efficiency as well.

Such a framework can also be used to decide which services to implement as e-Government services. Should a service be provided through a downloadable form, or should the form be interactive? If an interactive service is offered to the citizens/businesses, how much effort should be invested in integration with back office? How to decide which service to implement among several candidate services? These are some of the questions this chapter will help answer.

5.1.4 *Guidance to the Reader*

Section 5.2 discusses efficiency of e-Government services using a stakeholder approach. Section 5.3 discusses the design of an indicator set. The last section contains a discussion and provides directions for future work.

5.2 Measuring Efficiency of e-Government Services

According to Oxford English (2006), efficiency is

> the state or quality of being efficient.

The adjective efficient means

> working productively with minimum wasted effort or expense.

The Oxford Dictionary of Business and Management, fifth edition (2009) elaborates:

> 1 (technical efficiency) A measure of the ability of an organization to produce the maximum output of acceptable quality with the minimum of time, effort, and other inputs. One company is said to be more efficient than another if it can produce the same output as the other with less inputs, irrespective of the price factor. 2 (economic efficiency) A measure of the ability of an organization to produce and distribute its product at the lowest possible cost. A firm can have a high technical efficiency but a low economic efficiency because its prices are too high to meet competition.

Djellal and Gallouj (2008) created the following figure to show the relationship between concepts related to efficiency (Fig. 5.1).

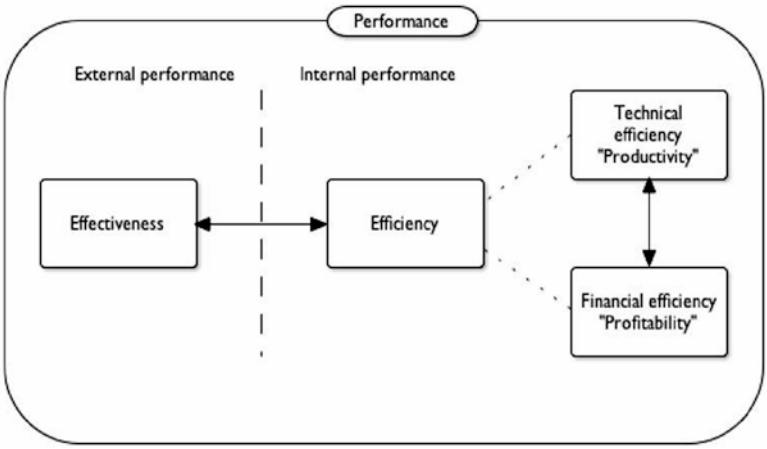

Fig. 5.1 The interrelationship between concepts (Djellal and Gallouj 2008)

Effectiveness (or external performance) describes to what extent objectives are achieved, but does not take into account costs of production. An organization is effective when it meets its targets. Efficiency (or internal performance) is addressing the ratio between input and output. If you put in a certain amount of resources and get more output, you are more efficient. Similarly, if you are able to produce something with fewer resources, you are more efficient.

Performance has a broader meaning, since performance also includes other important aspects as seen by both the users and the provider, e.g., quality.

5.2.1 Public Sector Efficiency

Efficiency studies have their origin in manufacturing, where it is relatively easy to establish the inputs (e.g., raw materials and labor) and outputs (goods produced). Public sector provides services and brings some new challenges.

5.2.1.1 Methodologies for Measuring Public Sector Efficiency

Djellal and Gallouj (2008) discuss how to measure productivity in public services. Their book starts with a description of traditional techniques for performance measurement and then discusses the special problems of measuring performance of services. Public services are seen as further refinement of services in general.

They divide the methods used into two categories: index-based methods and frontier techniques. Index-based methods are based on indicators. Frontier techniques are used to compare similar production units. The production frontier is made up of the most efficient production units in a given sample. The efficiency of the other units is assessed relative to this empirical frontier.

Index-based techniques are common among bodies responsible for national and international statistics (e.g., OECD), while frontier techniques have successfully been used in research contexts.

5.2.1.2 What Is Analyzed?

In most cases, studies of public sector efficiency have targeted specific areas of service provision, e.g., culture, education, energy supply, health care, public facilities, security, transportation, and administrative units (e.g., local governments) (Kalb 2010).

To measure efficiency of services is not trivial. Djellal and Gallouj (2008) list the following reasons why provision of services is more difficult to measure:

- Output is fuzzy: “Services are generally characterized by a relatively vaguely defined, intangible and unstable output. The process of producing a service does not culminate in the creation of a tangible good. Rather what is produced is a

'change of state'. The product is an action, a treatment protocol or a formula - in other words, a process and a way of organizing that process. In many cases, it is difficult to map the boundary of the service."

- Output makes its effects felt over time: "Any definition of services must take account of the temporal variable. After all, it is important to distinguish the immediate aspect of a service (the acts involved in providing it) from its effects in the medium and long term. Thus in the English-language literature a distinction is made between output and outcome (the long-term result)."
- Output depends on value systems: The definition of output is often not objective, but rather subjective, based on the value systems of the users and the provider.
- Output is interactive (or coproduced): Users often take part in the production. Such a simple thing as filling out an application form is in fact coproduction, since the user takes part in producing the result (e.g., filling a position or a place in a kindergarten).
- Output is not stockable: Services are often consumed as they are produced. The consumers and the providers often have different views on the valuation of the services.

Coproduction is an essential feature of electronic services. The users do their part; the administration does its part. Due to value systems and different views on valuation, it is necessary to look at efficiency both from the user perspective and the administration perspective.

5.2.1.3 The Usefulness of Public Sector Performance Studies

There have been arguments over the usefulness of performance measurement in the public sector. Hans de Bruijn (2007) summarizes arguments from both sides as follows:

> On the one hand, there is the view that performance measurement does not do any justice to the nature of the activities performed by professional organizations. Professional organizations are organizations that provide public services. These public services are multiple-value ones (i.e. they have to take several values into account) and are rendered in co-production (in cooperation with third parties),

and

> The opposite view begins with the idea of accountability. The more complex the services that professional organizations must provide, the more necessary it is to grant these organizations autonomy in producing such services. While they are autonomous, they are also accountable, however: How do they spend public funds? Does society receive value for money? After all, granting autonomy to a professional organization may cause it to develop an internal orientation, to be insufficiently client oriented, to develop excessive bureaucracy and therefore to underperform.

He concludes that performance measurements are beneficial, but it is necessary to be aware of the possible negative effects of performance measurements.

5.2.2 Internal and External Efficiency

Efficiency in the context of e-Government services is different from service efficiency in general.

- e-Government services are, when properly implemented, obviously efficient for the administration (internal efficiency), which can utilize information systems to reduce time spent on processing.
- e-Government services can also be efficient for the citizens/users and businesses by reducing the time spent on transactions with the municipality or agency (external efficiency).

Example: Downloadable forms are more efficient than paper-based forms. The ability to submit a form online is more efficient than downloading, printing, and mailing a form. If parts of the information in the form are filled out automatically based on existing knowledge about the citizen or business, or if the form is able to capture typographical errors or inconsistencies before submission, efficiency is improved even further.

This illustrates the need to use stakeholder perspectives on the efficiency of e-Government services.

5.2.3 Stakeholder Perspectives

Axelsson et al. (2012) discussed agency efficiency and citizen benefit based on a stakeholder-centered analysis of a specific case: A system used to handle anonymous grading of university exams.

Their approach was for each stakeholder to identify the need for the electronic service, their influence on the development of the e-service, how the e-service affects their performed activities and their opinions, and reactions related to the electronic service.

The main argument is that two stakeholders (citizens and agency) may be insufficient to get a good understanding; it is also necessary to bring in the context in which the stakeholder operates. But the authors also argue that the distinction between external and internal stakeholders is important.

For the purpose of analyzing efficiency of electronic services, we will focus on internal and external efficiency. It is still important to understand the context in which the services are used.

5.2.3.1 Administration Perspective (Internal Efficiency)

The common reason for implementing e-Government services is to reduce the administrative workload. Common goals are to establish "self-service" solutions and provide integration with back-end systems. The ultimate goal is to automate processes to minimize human intervention. Electronic processing is cheap; work done by humans is expensive.

Table 5.2 Variables used to calculate performance of e-Government sites (Watson et al. 2000)

Variable	Meaning
Q_0	Number of people within target group with web access
Q_1	Number of people aware of the e-commerce site
Q_2	Number of hits on the e-commerce site
Q_3	Number of active visitors to the e-commerce site
Q_4	Number of purchases
Q_5	Number of repurchases

5.2.3.2 Citizen/User/Business Perspective (External Efficiency)

e-Government can also be seen as more efficient from a citizen/user or business viewpoint. The possibility to access online information or fill out an interactive form can save time for a citizen or a business entity, but not necessarily. If the information is not easily accessible through good information structure or search engines, the user can perceive online services as a waste of time. If the user has to enter data into an interactive form instead of making a copy of the document containing the original data, the use of the interactive form suddenly becomes cumbersome. We therefore argue that efficiency of an e-Government service needs to take into account how users experience the efficiency of the service. This is why context of use becomes important.

5.2.3.3 Environmental Perspective

The provision of e-Government services may also be seen as efficient from an environmental viewpoint. By limiting the use of paper documents and physical distribution, e-Government services can be a part of saving the environment.

5.2.4 Efficiency of e-Commerce

In their book "Electronic Commerce—The Strategic Perspective," Watson et al. (2000) propose a set of five e-commerce performance indicators: awareness, attractability, contact, conversion, and retention.

These indicators are based on the set of variables shown in Table 5.2.

The first indicator is awareness efficiency. This indicator expresses the ratio between those who know the site and the total number of people within the target audience that have Internet access:

$$Awareness\,efficiency = \frac{People\,aware\,of\,the\,site}{People\,with\,Internet\,access} = \frac{Q_1}{Q_0}$$

Awareness can be influenced by marketing campaigns for the e-commerce site. The second indicator is attractability efficiency. This indicator shows the ratio

between those hitting the site and those who know the site. Note that a hit is not the same as a visit. A hit means that a user lands on the site. A visit means that the users do more interaction over longer time, e.g., browsing the site for certain goods:

$$Attractability\ efficiency = \frac{Hits\ on\ the\ site}{People\ aware\ of\ the\ site} = \frac{Q_2}{Q_1}$$

The third indicator is contact efficiency. This is the ratio between active visitors and those hitting the site:

$$Contact\ efficiency = \frac{Active\ visitors}{Hits\ on\ the\ site} = \frac{Q_3}{Q_2}$$

The fourth indicator is conversion efficiency. This is the ratio between active visitors and those making a purchase:

$$Conversion\ efficiency = \frac{Purchases}{Active\ visitors} = \frac{Q_4}{Q_3}$$

The fifth and final indicator is retention efficiency. This is the ratio between purchases and repurchases made by the same customer:

$$Retention\ efficiency = \frac{Repurchases}{Purchases} = \frac{Q_5}{Q_4}$$

These five indicators are used to calculate an average web site efficiency index:

$$Website\ efficiency = \frac{1}{5}\sum_{1}^{5}\frac{Q_n}{Q_{n-1}}$$

According to the authors, this calculation may be misleading, since the factors may not have the same importance for a given context. A more refined and appropriate measure might be a weighted average:

$$Website\ efficiency = \frac{1}{5}\sum_{1}^{5}\frac{Q_n}{Q_{n-1}}u_i$$

In this case, the factor u_i represents the weight of indicator i.

5.2.5 e-Government Service Performance

In her paper "Measuring the Performance of Electronic Government Services," Steyaert (2004) adapted the framework of Watson et al. (2000) and used it to analyze six agencies and two federal and state government samples. She used the variables/indicators shown in Table 5.3.

Some of the ideas from Watson et al. (2000) and Steyaert (2004), e.g., the ratio between users of Internet service and total number of users, are used in Sect. 5.3,

Table 5.3 Indicators used by Steyaert (2004)

Variable	Meaning	Indicators	Ratio
n_0	Awareness efficiency: the total number of Internet visitors relative to total agency visitors or consumers	Number of Internet self-service consumers/number of agency consumers	Q_1/Q_0
n_1	Popularity efficiency: agency rank (in monthly visitors) relative to the rank of other federal and state agencies (in monthly visitors)	1/rank of agency site	$1/Q_2$
n_2	Contact efficiency: a score based on overall site content (e.g., convenience, security, and privacy with online data, publications, e-mail, licenses, etc.)	Overall content score/100	$Q_3/100$
n_3	Conversion efficiency: scores based on customer satisfaction with federal services, state electronic transactions, and visitor time	Customer satisfaction and transactions/100	$Q_4/100$
n_4	Retention efficiency: customer loyalty based on repeat transactions and repeat visits	Repeat transactions on site/ transactions on the site	Q_5/Q_4

outlining a set of indicators for e-Government service efficiency. But these two frameworks do not take into account the time saved by users and administration. While some of the indicators proposed here are obviously important, we argue that time saved is the most important indicator for measuring efficiency gain.

5.3 Indicators for e-Government Service Efficiency

Efficiency indicators aim to serve as measurement units of how efficient e-Government services are from the different stakeholder perspectives. The work done by Watson et al. (2000) and Steyaert (2004) described in the previous section only looks at efficiency from the site owner (or administration perspective). Auer and Petrovic (2004) introduced the idea of both customer and provider perspectives. In the context of e-Government, the customer is a citizen or business and the provider is the administration.

5.3.1 Individual Services

Efficiency can be seen as a property of a service. Efficiency gains happen when a service is replaced or improved, e.g., as an e-Government service. The first step will be to compute the efficiency gain of each individual service. Examples of such services may be kindergarten applications or applications for positions within a government agency or a municipality.

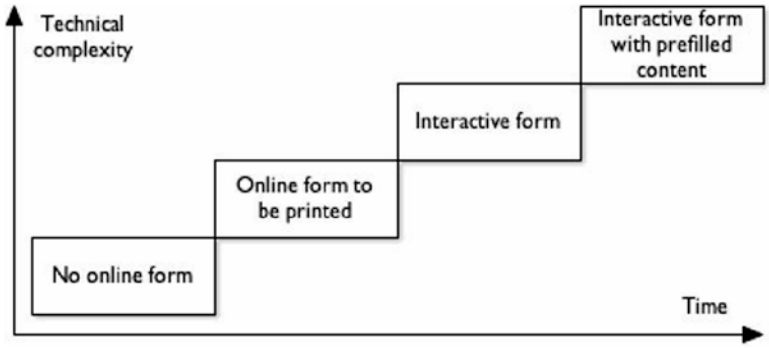

Fig. 5.2 e-Government maturity model (Inspired by Layne and Lee 2001)

5.3.1.1 Citizen/User Perspective

What is the efficiency gain for the citizen/user using a downloadable form or an interactive form compared to an off-line service? The efficiency gain can be expressed as time saved for the citizen/user but may also include direct costs, e.g., postage to send a form through ordinary mail.

The efficiency gain is related to the maturity of the service. Figure 5.2 shows a maturity model for e-Government services inspired from Layne and Lee (2001). The *y*-axis shows the technical complexity of providing the service, while the *x*-axis shows the development over time. On the lowest level, there are no online forms. The citizen/user has to contact the municipality or agency to obtain the form and will have to submit the filled-in form by mail or personal appearance. The next level is the provision of an online form that can be filled in and printed. The citizen/user still has to submit the form through ordinary mail or make a personal delivery. On the third level, the form is interactive. Information is filled in and submitted by clicking a button. The information is delivered electronically to the municipality or agency. On the fourth level, the interactive form is reusing information either entered through previous use or from existing information stored by the municipality or agency. A good form would also check the input.

Note: Some forms require the signature of the citizen/user, and this has been used a rationale for municipalities/agencies to provide printable forms instead of interactive forms. However, the use of electronic signatures is now becoming widespread. In order to get to the next maturity level, it may be necessary to enhance the technological solution to incorporate electronic signatures.

5.3.1.2 Administration Perspective

The maturity model will be somewhat different from the administration perspective. Figure 5.3 shows the maturity model from this perspective. If the user downloads a form, fills it out, and mails it, the efficiency gain from using an e-Government

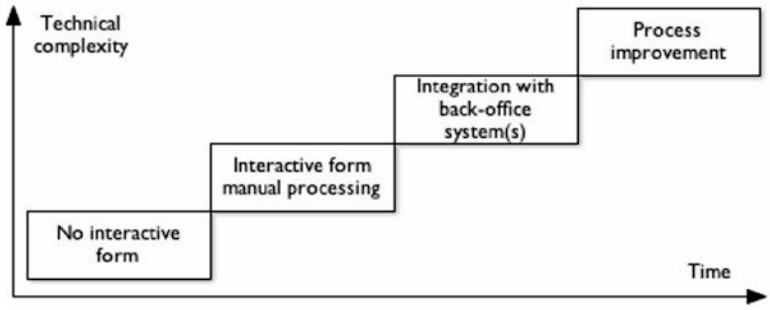

Fig. 5.3 e-Government services maturity model (administration perspective)

service is zero, except that form was obtained through self-service. An interactive form may have no integration with back-office systems. In this case the content of the form is sent as a message through a message-handling system, normally e-mail. In this case the efficiency gain is rather low for the administration. On the next level, the data submitted on the interactive form is directly transferred into a back-office system.

Example: A typical case is kindergarten application. The parents fill in the necessary information in the interactive form and submit it into the system that is handling admission and allocation. This system keeps track of waiting lists for each kindergarten. The data is then reused to send monthly bills to the parents, monitor the progress of each individual child, allocate children to staff members, etc.

There are two types of integration: vertical, where the data is transferred into one back-office system, and horizontal integration where the back-office system exchanges information with other relevant systems. The use of open standards and protocols for data interchange makes it possible to improve administrative processes.

5.3.2 Use of the Service

Building on the work of Watson et al. (2000), the actual and potential use of each online service is important indicators. Some of the most popular services that are provided through downloadable or interactive forms have an identifiable target group.

One example is online kindergarten applications. Here, the target group is all parents submitting applications, either on paper or online. That you have to apply for kindergarten is common knowledge. But some parents may have missed the option of applying online.

Our interviews with municipal executives have shown that kindergarten applications and applications for vacant positions are the two most successful electronic form-based services, not only because of efficiency gains but also due to quality

improvements of the processes. This includes the possibility to validate information before final submission. The usage factor can be computed as follows:

P_0 = Potential target group (total number of users)
P_1 = Users of the e-Government service
P_2 = Nonusers (P_0–P_1)

$$Usage\ factor\ for\ electronic\ service = \frac{P_1}{P_0}$$

Example: One municipality had a total of 311 kindergarten applications. 290 applications were submitted online; the rest were paper-based applications.

The usage factor is 290/311 = 0.93 (93 %).

5.3.3 Efficiency Gain

The efficiency gain is the time or money saved by citizens/businesses and the administration due to the use of the e-Government service.

5.3.3.1 Efficiency Gain for the Individual Citizen/Business

U_0 = Time used by citizen/business to fill in and submit a paper-based form
U_1 = Time used by citizen/business to fill in and submit an interactive form

$$Efficiency\ gain\ for\ citizen\ or\ business: 1 - \frac{U_1}{U_o}$$

Example: An average citizen/user uses 10 min to fill in an online application and 25 min to fill in and submit a paper-based application. The user of the interactive form uses only 40 % of the time spent by a user using the paper-based version. The efficiency gain for the user of the e-Government service is 1 – (10/25) = 0.6 (60 %).

5.3.3.2 Efficiency Gain for Administration (for Each Request)

A_0 = Time used by administration to process a paper-based form
A_1 = Time used by administration to process an interactive form

$$Efficiency\ gain\ for\ administration: A = 1 - \frac{A_1}{A_o}$$

Example: The administration uses 3 min to process an online application and 20 min to handle a paper-based application. The administration uses only 15 % of the time to handle an interactive form compared to a paper-based form. For the administration the efficiency gain is 1 – (3/20) = 0.85 (85 %).

5.3.4 Total Efficiency Gain for an Individual Service

To calculate the total efficiency gain for an individual service, it is necessary to include the ratio between users of the e-Government service and the size of the target group. The total efficiency gain will always be lower than the individual efficiency gain, if the usage is below 100 %:

$$Total\ user\ efficiency\ gain = 1 - \frac{P_1 \times \left(1 - \frac{U_1}{U_0}\right) + P_2}{P_0}$$

$$Total\ administration\ efficiency\ gain = 1 - \frac{P_1 \times \left(1 - \frac{A_1}{A_0}\right) + P_2}{P_0}$$

It is also possible to calculate the potential efficiency gain of transforming non-users into users.

Note: It does not make sense to add the efficiency gain for the citizens/users and administration together. These are separate measures. The time spent by administration is often easily transferable to costs, while the time spent by users is more about how user-centric the government agency/municipality is perceived by the users.

Example: The following shows how to calculate efficiency gain for citizens and the administration. The example is based on real numbers from a Norwegian municipality.

Case: Kindergarten Applications

Citizens
$U_0 = 25$ min, $U_1 = 10$ min.
Efficiency gain for each citizen is $(1 - 10/25) = 0.6$ (60 %).
Users of interactive service: total users (P_0) = 311, e-service users (P_1) = 290, nonusers (P_2) = 21.
Time spent by e-service users is $290 \times 25 \times (1 - 0.6) = 2{,}900$ min.
Time spent by noninteractive users is $(311 - 290) \times 25 = 525$ min.
Total time spent for both groups: $2{,}900 + 525 = 3{,}425$ min.
If everyone used paper-based form: $311 \times 25 = 7{,}775$ min.
Efficiency gain is $1 - (3{,}425/7{,}775) = 0.56$ (56 %).

Administration
$A_0 = 20$ min, $A_1 = 3$ min.
Efficiency gain for each submission = $(1 - 3/20) = 0.85$ (85 %).
Users of interactive service: total users (P_0) = 311, e-service users (P_1) = 290, nonusers (P_2) = 21).
Time spent caused by interactive users is $290 \times 20 \times (1 - 0.85) = 870$ min.
Time spent caused by noninteractive users is $(311 - 290) \times 20 = 420$ min.

Total time spent for both groups: 870 + 420 = 1,310 min.
If everybody used paper-based form: 311 × 20 = 6,220 min.
Efficiency gain is 1 − (1,310/6,220) = 0.79 (79 %).

Note: For the individual user/citizen, the time saved by all citizen/users is normally of limited interest. But the number is important for decision makers when deciding what electronic services to implement.

5.3.5 Aggregation of Individual Services

The efficiency gain of individual services may be aggregated to show the total efficiency gain for all services. The number of available services varies from municipality to municipality. For benchmarking purposes, it seems reasonable to select a subset of common e-Government services

5.3.6 A Simplified (Lightweight) System of Indicators

In many cases, it is not feasible to perform studies of the time spent by users and administration. Therefore, a simplified system is proposed based on easily observable characteristics of the service.

Based on the maturity model shown earlier, points could be awarded to each level in the following way:

User perspective:
1 = No e-Government service
2 = Downloadable form
3 = Interactive form
4 = Interactive form with prefilled content

For the user, a downloadable form is more efficient than no form at all. An interactive form is better, since physical delivery is avoided. An interactive form with prefilled content, based on what the government already knows, is even better.

Administration perspective:
1 = Downloadable form or no e-Government service
2 = Interactive form
3 = Interactive form with back-office integration
4 = Process improvement

For the administration, an interactive form reduces manual work. Back-office integration is even more efficient, since information does not need to be manually transferred. If the administrative processes get more efficient due to integration, it is even better.

Use:
1 = seldom used (0 % < use < 10 %)
2 = sporadically used (10 % < use < 50 %)
3 = often used (50 % < use < 90 %)
4 = heavily used (90 % < use)

The use of e-Government services are often not easy to assess. The four categories were selected based on discussions with municipal representatives.

The points in each category are multiplied to give a relative value for the efficiency gain. The following examples are based on informal interviews with municipal representatives:

Example 1: Application for kindergarten
Interactive form. Data is retained from previous year (4 points). The form is integrated with back-office application, but no evidence of process improvement is given (3 points). The solution is heavily used (4 points). Total points: 48.

Example 2: Complaint form
Interactive form (3 points). Form data is converted into an e-mail (2 points). The solution is sporadically used as most complaints are submitted by phone, e-mail, and personal appearance (2 points). Total points: 12.

Note: A low number of complaints may be positive, since it can indicate general satisfaction with the service provision.

Example 3: Applying for positions.
Interactive form (3 points). Form data is converted into e-mail (2 points). The use is mandatory (4 points): Total points 24.

Note: We do not know how many is excluded from the application process based on the mandatory use of interactive forms.

These three examples show how an assessment can be made by a short investigation of a specific e-Government service. The reason for using this lightweight approach is to reduce the time spent on assessment.

5.3.7 Other Possible Indicators

The following indicators are related to efficiency and may be included in the future set of indicators:

- Easy to find/findability: How much time does a user spend to get hold of a paper-based form or to find the downloadable or interactive form? The time used is now included in the time spent to retrieve, fill in, and submit a form. However, this aspect is more related to information design, which could justify a separation of this particular aspect.

- Process intervention: Can a user cancel or modify a request for a service (a submitted form). A cancellation or modification is an exception but may be very time-consuming for both the user and the administration. If the user can cancel or modify a request, this would be more efficient than having to contact administration to solve the problem.
- Process transparency: Can a user follow the process of the service request online? This could save time both for the user and the administration, since other contacts asking for status (mail, telephone calls) could be avoided.

5.4 Conclusion/Discussion

Most research on efficiency has not tried to quantify the actual efficiency gain different stakeholder groups obtain by using an electronic service. This chapter examined earlier research and ended up with a proposed methodology and a set of indicators to calculate efficiency gain both for the administration and the citizen/user/business that use an electronic service. Since the methodology requires some observation or self-reporting by users, a lightweight approach was also introduced to make comparisons between electronic services easier.

The material in this chapter can be used to:

- Benchmark efficiency of e-Government services
- Help deciding what electronic services to implement

Both methodologies have been developed in collaboration with eGovMon partner municipalities and agencies. The initial ideas for efficiency measurements were presented on a workshop held in Grimstad, Norway, on September 12, 2008. The ideas were refined in subsequent semiannual workshops and were finally tested on real-world examples in a workshop held in Tønsberg, Norway, on March 7 and 8, 2012. In this workshop we used numbers from municipal partners to show efficiency gains obtained from two specific e-Government services: applying for positions and kindergarten applications. The participants confirmed that the methodology is useful to justify investments in form-based e-Government services.

In the same workshop, the lightweight approach was used to prioritize what e-Government services to maintain and develop further. This approach does not report the actual efficiency gain but calculates an index showing the relative importance of each service. Participants confirmed that the lightweight approach required substantially less work but still provided information that could be used to rank services.

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Chapter 6
Generic Mechanisms Influencing e-Initiative Adoptions: Perceptions of Key Actors

Mark Liptrott

Abstract This chapter draws on research into variables influencing Election Officers' decision-making on e-voting adoption in the UK with additional data from a senior executive of the Association of Electoral Administrators (AEA).

The qualitative research underpinned by the realist paradigm focused on the 2003 and 2007 e-voting pilot programmes. Following a review of relevant literature, the enquiry involved a series of semi-structured interviews with samples of Election Officers in authorities that joined the 2003 and 2007 pilot programmes and a sample of those who had declined to join. An interview with a senior executive of the AEA verified the findings.

The results suggest a series of broad-based lessons that can be used to better inform e-government policy design. The lessons result from the limitations in the pilot evaluation strategy which failed to identify reasons that local authorities declined participation in the e-voting pilot programme.

The conclusion suggests that the values and beliefs of actors involved in local e-policy adoption decision-making are pivotal. It further suggests that there are practical steps that, if taken by policymakers, have the potential to address mechanisms that influence against voluntary e-government policy adoption.

6.1 Introduction

This chapter discusses broad lessons from the UK pilot programme of e-voting that resonate through the years with the potential to influence the voluntary adoption of e-government policies. The discussion includes looking beyond the traditional role of evaluation, a strategy suggested by Dye (2002) and Hertting and Verdung (2012),

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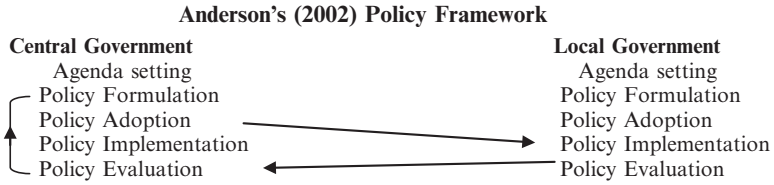

Fig. 6.1 The 'critical stage'

to identify influences on policy adoption decision-making. Data from Election Officers in local authorities that declined to join the e-voting pilots demonstrated the limitations of the evaluation strategy as it failed to identify variables influencing against e-voting adoption. These variables form the basis of lessons that can be extrapolated to the design of other e-government policies.

This chapter is based on research into the 2003 and 2007 English pilot programmes. It draws on data from interviews with Election Officers in local authorities that took part in the schemes and with those that did not, demonstrating their key role and power over e-initiative adoptions. The findings show that weaknesses in the design of the policy introducing e-voting resulted in falling numbers of local authorities voluntarily adopting the new voting methods. e-Voting was introduced using local government as a conduit through which to implement the pilot programme. Allowing individuals to vote at a time and place of their choosing appeared to be a natural progression in the use of ICT: yet local authorities did not readily adopt the schemes. Following each e-voting trial, the Electoral Commission issued a report based on feedback from pilot participants. The trials were a fact-finding tool to assess the capabilities and any problems. It was envisaged that this process of testing and evaluation would continue until the methods became mature and they could be introduced throughout the country (Electoral Commission 2003).

It is expected that evaluation will assess and provide an understanding of whether policies have worked so lessons can be learned to inform improvements (Sanderson 2002). However, in the case of e-voting, the evaluation focused on local authorities that voluntarily joined the pilot programme rather than including the impact on the wider local authority community. This limitation in the evaluative strategy failed to identify reasons for non-participation in the pilots.

The research used Anderson's (2002) heuristic policy framework, Fig. 6.1 above, as an analytical tool to show that following policy formulation and adoption of e-voting by central government, policy implementation passed to local government. This was the 'critical stage'. It was at this stage in the policy process that variables influencing policy adoption exercised most influence on local adoption decision-making. Those variables acted either to enhance the likelihood of policy adoption or as policy adoption-blocking mechanisms which could be addressed during policy design to transform them into mechanisms that would enhance the likelihood of policy adoption. Following each pilot, local authorities' evaluation report passed through the Electoral Commission to central government supposedly to inform

policy revisions. This cyclical view of policy shows evaluation as a critical link in the chain (Hogwood and Gunn 1988).

The chapter is structured as follows: the next section discusses the context and rationale behind the introduction of e-democracy, noting that attempts to promote e-democracy are not limited to the UK. The third section discusses the research methodology. The fourth section considers theoretical variables influencing local policy adoption decision-making. The fifth section discusses findings from the 2003 and 2007 pilots, identifying variables influencing pilot participation. The penultimate section discusses the research results relating them to prior research. The final section fulfils the aim of the chapter suggesting broad lessons that can be drawn from the e-voting pilots. It suggests seven lessons that have the potential to better inform policy design to enhance the likelihood of the voluntary adoption of e-government policies introducing technology through pilot schemes.

6.2 Contextual Perspectives

The expected shift to the UK e-democracy was underpinned by concern for the democratic deficit. e-Voting was introduced in part as a strategy to address the lack of interest in political activity as voting is the 'primary means by which most citizens contribute to collective decision-making in a democratic polity' (Birch and Watt 2004:64). Participation in democratic processes using communication technologies is readily available through Internet blogs, chat technologies and forums, yet the availability of the new technologies does not appear to have spurred conventional political participation (Saebo et al. 2008).

The driver behind the UK decision to introduce e-voting was falling turnouts at elections. Turnouts at elections at every level had been falling from a high of 83.6 % in the 1951 General Election to a low of 59.4 % in 2001 and had recovered slightly in 2005 with a turnout of 61.3 and 64 % in 2010 (Electoral Commission 2005, 2010). Unease over falling turnouts resulted in the Representation of the People Act (2000) that began the process of pilot schemes trialling voting experiments with the first pilot in England in 2000 and further pilots in 2002, 2003, 2004, 2006 and 2007. e-Voting was to be implemented in parallel with traditional ballots, and local authorities were invited to join the programme. Nick Raynsford, then Minister in the Office of the Deputy Prime Minister (ODPM), the department acting as Change Agent, stated in 2003, 'These innovations will help to make elections more relevant, straightforward and accessible for voters' (Electoral Commission 2003:1).

The move to electronic voting was part of the UK government's policy to establish an e-society where individuals would use electronic means to conduct many aspects of their everyday lives (Fairweather and Rogerson 2002). The government set a target of 2005 for electronic service delivery and aspired to hold an e-enabled general election sometime after 2006 (Cross 2004). e-Democracy was seen as a way to deepen democracy by increasing the number of voting channels allowing citizens to vote at a time convenient to them. A team was established to promote e-democracy initiatives.

Table 6.1 Pilot programme technology in 2003 and 2007 and number of participants

Year	All postal	e-Counting	Kiosk	Internet	Telephone	SMS text	Digital TV	Other (ballot paper innovations, voting hours, etc.)
2003	39	8	8	14	12	4	3	8
2007		5		5				9

Electoral Commission 2003, 2007a

The resultant Green Paper divided e-democracy into e-participation and e-voting. The assumption was that as a result of television shows such as Big Brother, citizens were willing to use technology as part of the decision-making process (Wright 2006).

English local authorities were invited by central government to participate in the e-voting pilot programme. May 2003 saw the largest pilot scheme with 59 English local authorities taking part with almost 6.4 million people eligible to vote in the pilot areas. In that year over half the schemes offered all postal voting and some locations offered extended hours to voters using the conventional ballot box. Seventeen pilot programmes offered a combination of e-voting, of those 17, 14 offered Internet voting (Electoral Commission 2003). Table 6.1, above, shows the voting technology and the number of pilot participants.

In the English 2007 local elections, further voting experiments sought to test how voting in different locations and at different times could enhance the voting process (Electoral Commission 2007a). However, only 12 out of almost 400 local authorities volunteered to participate in the pilot scheme, agreeing to trial a combination of voting experiments with five including Internet voting, as shown in Table 6.1 above.

The pilot programme was successful in that it identified issues that required addressing prior to a national rollout of the technology. These centred on issues of security highlighted by reports from the Electoral Commission (2007b) and the Committee for Standards in Public Life (2007). They resulted in the suspension of further voting experiments.

The UK government believed that offering an increased number of voting channels would encourage a rise in voter turnout at elections. However, citizens are increasingly disillusioned with the political sphere and believe that politicians are only interested in holding on to power and will promise anything to achieve the required number of votes (RFT 2006). There is no public demand for new voting methods, and Fairweather and Rogerson (2002) argue that their introduction would not increase the numbers of citizens who were willing to vote. There is now a growing realisation that citizens are also becoming self-interested and are more interested in the nuances of politics; they now vote when they feel strongly about an issue (Roberts 2010).

The issue of citizens' lack of political participation is not limited to the UK; concerns within the EU mirror those within the UK. The EU has recognised that public participation is 'the highest order of public engagement' as the Commission expresses concern regarding public disaffection with the political sphere and falling approval rates for politicians (EIPP 2009:6). There is recognition that declining trust in both politics and political institutions distances citizens from governments (Pratchet and Lowndes 2004).

The UK's refusal to pursue e-voting is mirrored throughout Europe and the USA. States in the USA such as Florida and Washington are reverting to paper ballots while retaining scanning system to count ballots. Budget constraints limit their investments in new voting methods whereas there is acknowledgement that optical scanning expedites counting. If new voting systems fail, ballots cannot be cast, but if electronic counting systems fail, votes can still be cast and counting can be conducted manually (Kilmas 2012).

Attempts in the developing world to harness new voting methods appear to be failing. The Kenyon experience of 2013 was a stark reminder of the risks involved. Voting was chaotic as what was to be the most modern system collapsed as biometric readers to scan voters' thumbs ceased to work, the SMS system became over loaded and some election operators forgot passwords and PINs for the software. Polling centres reverted to paper ballots and counting (Kuo 2013).

In Europe only two countries appear enthusiastic about e-voting, Switzerland and Estonia, where it is still believed e-voting offers a solution to falling voter turnouts at elections. In Estonia 16 % of the public who used e-voting said they would not have voted had e-voting been unavailable. Nevertheless, voices have been raised expressing fears for the security of the systems (Scammell 2013). The European Union views the growth of ICT as essential to modernise public administration to provide new forms of service delivery and to stimulate participation (Nixon and Koutrakou 2008). The former Vice President of the European Commission, Wallstom, introduced the strategy to promote debate on European issues which has become the movement called Political Foundations. She stated, 'I firmly believe that communication, dialogue and active involvement of the citizens is crucial for the Union's ability to achieve its objectives… We need to make it clear to the citizens that their political choice matters' (Wallstrom 2010). The importance of citizens' participation is bolstered by the designation of 2013 as European Year of Citizens, when citizens will be reminded of their rights and what the European Union can do for them.

6.3 Research Methodology

The goal of this research was not to produce standardised results capable of replication; rather the aim was to 'produce a coherent and illuminating description of a perspective of a situation that is based on, and consistent with, detailed study of that situation' (Schofield 1998:92). Accordingly, this research adopted a qualitative rather than quantitative approach to data collection believing, like Miles and Huberman (1994:232), that qualitative research offers an understanding of 'what happened and how and why it happened', an ideal approach to find out reasons for local e-voting adoption decision-making. The research was underpinned by the realist paradigm which appeared most appropriate to look behind actual local authority decision-making processes to understand reasons for actions regarding e-voting pilot adoption. 'Realists believe that there is a 'real' world 'out there' to discover and the contexts of phenomena are very important' (Sobh and Perry 2006:1200).

The sampling unit was English local authorities. The initial sample was chosen using purposeful, disproportionate, stratified, convenience sampling. In 2003, 59 out of almost 400 English local authorities volunteered to trial the new voting methods. This produced two groups of authorities: those which trialled e-voting and those that did not. Fourteen of these trials included the use of the Internet. From the Internet adopters, a sample was selected based on a judgement regarding the quality of information that could be obtained. The aim of this purposeful sampling was to select information-rich cases that would provide insights into the questions of the study (Patton 1990). Using the same strategy, further authorities were selected from the group containing the non-adopters. As the research progressed, supplementary interviews checked the validity of variables influencing e-voting adoption identified in the initial interviews.

The research sought to answer the question 'Why did local authorities decline participation in the trials of e-voting?' This was original research asking a question never asked in the government research. The official research only prepared for the introduction of e-voting and with such narrow parameters failed to address issues with the potential to impact on local receptivity to e-voting. This research addressed that omission. The findings also identified a significant variable that enhanced the likelihood of e-voting adoption. A review of literature identified variables influencing local adoption of policies introducing e-initiatives, discussed briefly in Sect. 6.4. These variables acted as a heuristic device to design the interview schedule for a series of semi-structured interviews with Election Officers and were used as a basis for data analysis. The initial interviews took place with samples of Election Officers who had taken part in the 2003 pilot programme and who had declined participation. Using the original interview schedule revised as a result of the initial findings, further interviews took place with a sample of Election Officers who had joined the 2007 pilots and with Election Officers in authorities who had joined the 2003 pilots yet in 2007 declined further participation. The findings were corroborated in an interview with a senior executive of the Association of Electoral Administrators (AEA). All respondents were assured of anonymity.

This research was based on the case-study technique that provided a 'strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon with its real life setting using multiple sources of evidence' (Yin 2003:2). It was a comparative case study designed to illuminate local drivers for decision-making on voluntary adoption of a technological innovation introduced through the public policy process, as Stake (2000:241) states, 'we come to know what has happened by what others reveal'.

6.4 Theoretical Variables Influencing e-Initiative Adoption

A review of prior research identified variables influencing local authority decision-making on technology adoption. Among the most powerful variables are perceptions of local elected representatives, voters' attitudes, the design of policies and system integrity.

6.4.1 Local Perceptions

In order to secure the adoption of a policy introduced by central government for voluntary adoption by local government, such as the e-voting policy, there needs a positive attitude to that policy from local politicians (Hogwood and Gunn 1988). Rose (1989) holds that local councillors concentrate on self-advancement as they strive to be re-elected, and Dolan et al. (2010), in the consultation paper, *Mindspace*, recognise self-interest can influence the acceptance of a public policy. Many councillors may have considered that increasing the choice of methods of voting was beneficial, but some may have preferred that the number of voters remained low, reducing the likelihood of losing their seats (RFT 2006).

6.4.2 Voter's Attitudes

Local councillors may have realised that technological penetration and voter capacity raised significant problems. There is a social divide between the people who have access to the new technology and those citizens who do not, known as the digital divide. Norris (2001), who prefers to call it the democratic divide, pessimistically expounds the reinforcement theory that those people who already use the new technology are already politically engaged and that it seems improbable that digital politics will reach the disengaged. In contrast, Peralta (2003) argues that there is no evidence that electronic voting will exacerbate the problem of the disengaged groups; in fact she holds that with proper implementation of the new technology, there may be an increase in voter turnout in under-represented groups.

It is generally the younger citizens who will readily accept and use technological innovations, so electronic voting may have had the advantage of appealing to the disproportionate number of hard-core nonvoters usually aged between 18 and 25 (Alvarez and Hall 2004). However, the problem of the decline in the younger citizens' sense of civic responsibility is becoming more severe while the problem of technology acceptance is generational and so will dissipate. Nevertheless, even though the technology may become more acceptable and less expensive, there may be individuals who simply opt out as the new technology does not benefit them or they simply reject it (Kersting and Baldersheim 2004).

6.4.3 Policy Design and Context

Prior research identified the importance of the correct causal theory during policy formulation. However, providing an increase in ways of casting a vote will not promote democratic engagement. The issue impacting on voter turnout at elections was, and remains, the citizens' alienation from the political sphere (Roberts 2010; RFT 2006; Fairweather and Rogerson 2002; Work Foundation 2002).

It is recognised that there are certain measures that central government can incorporate into policies in order to facilitate a change such as e-voting, as the manner in which a policy change is introduced will aid its implementation (Dawson 1994). The policy introducing e-voting was identified as incremental with the new voting methods being introduced to complement traditional voting methods rather than replace them. This adaptive approach was identified by central policy designers as most appropriate to enhance e-voting adoption.

A key measure to enhance the likelihood of successful policy adoption is the provision of policy tools to create the context to allow changes to administrative structures and to provide additional staff and training (Rose 2005). Election Officers who volunteered for an e-voting pilot would also have been conducting a traditional ballot and so would require additional funding to allow for the extra workload.

In addition to adequate resources, a further significant measure influencing policy adoption is the requirement to have a policy direction in order to achieve its aims (Schein 2004). In 2002 the Electoral Commission recommended that the pilot programme needed a 'clearly articulated strategic direction' and a year later recommended 'as a priority' a detailed road map towards its stated goal (Electoral Commission 2002:8, 2003:7). The expectations of the policy appear to have altered; in April 2003, the former government minister Nick Raynsford stated that the 'electoral pilots aim to improve turnout' while in June 2003 a spokesperson for the ODPM stated that raising turnout was not the main aim: 'it was more about widening access, extending choice and adapting to a modern lifestyle' (Waugh 2003; Parker 2003). This contrasts with the original aim of an evolving process to introduce the new voting methods and to 'create electoral processes that are efficient, robust and flexible and which can be adapted more readily to other electoral forms' (Fairweather and Rogerson 2002:3). The change of government emphasis between April and June 2003 may have been due the low increase of +2 % in voter numbers in the pilots of e-voting in the 2003 May elections, as voters failed to respond in significant numbers (Electoral Commission 2003).

6.4.4 System Integrity

Real challenges lie in the public's feelings of indifference and disillusionment with the political sphere coupled with the distrust of politicians. Transparency of the electoral process, accountability of holders of political office and party funding are important to maintain trust (Electoral Commission 2002). The public's indifference may erode support for conventional politics and electronic voting will not remedy this distrust of the political institutions (Parker 2003). Since 2003, public distrust of political structures and politicians has grown fuelled in 2009 and 2010 by the scandal of MPs expenses, and it appears that this mistrust has expanded to all aspects of the political sphere.

Local authorities need to reassure the public that the new voting methods would ensure the probity, accuracy and security of the electoral arrangements. The issue of electronic voting was linked to the general trust in political systems and

governments (RFT 2006). It is acknowledged that public trust and confidence in elections takes decades to develop but very little time to destroy (ICAVM 2002). Birch and Watt (2004) support Fairweather and Rogerson (2002) believing that electronic voting presents serious threats to the normal democratic perspective of a secret ballot, arguing that free and fair elections may not be possible as the threat of undue influence may compromise the freeness of the vote. Vociferous warnings of the inherent dangers of e-voting came from the USA; Mercuri's Statement on Electronic Voting (2001) warns that the computer industry does not have the capability to assure a safe reliable election using only electronic devices and she remains of the same opinion (Mercuri 2010).

6.5 Pilot Participation: Variables Influencing Local Decision-Making

The empirical phase of the research identified four variables acting as barriers to e-voting adoption and one that enhanced the likelihood of adoption. Election Officers in pilot authorities had their reasons for joining the pilots and Election Officers in non-pilot authorities had their reasons for declining participation. The first variable influencing local decision-making against pilot adoption was a lack of resources whereas the variable, status, exercised a positive influence encouraging pilot adoption. The second variable influencing against pilot adoption was the UK government's approach to policy design and implementation. The third and fourth variables, the beliefs and values of Election Officers and the security issues, also weighed against e-voting adoption.

6.5.1 Drivers Influencing Local Authority Decision-Making on Pilot Participation

In 2003 the variable that most influenced local authorities in this study *against* joining the e-voting pilots was the lack of resources. The majority of non-pilot Election Officers believed that to organise an e-election in conjunction with a traditional election would require a revision of their working practices, an increase in the number of specialist staff and an increase in funding. They were not willing to commit their authorities to extra expenditure as central government would only fund the electronic element of a pilot scheme and these officers considered that their authorities had higher priorities for local finance.

As one officer explained, his authority had only two members of staff to organise the ballot, and he believed that they could not cope with the extra work as they already worked hard to 'get it right'. He said:

> I would certainly like to join the pilot scheme but we must prioritise and I consider that public funds could be better spent. That said, if government allocated additional funds to allow us to recruit specialist, experienced staff and gave us all the funding to conduct all the

> elements in the trials, I would join in. Only being a small council we could not take it on board, we could not afford the possibility of having to partially fund a pilot.

In contrast, the variable exercising most influence on pilot authorities that joined the 2003 pilot scheme was status, a persuasive incentive also recognised by the executive of the AEA. Election Officers and other senior officials realised that participation in government initiatives, such as the e-voting pilot programme, brought tangible organisational benefits, such as Beacon Status, which in return for mentoring other authorities resulted in an increase in funding and a decrease in central monitoring. An officer explained:

> It is also the recognition, the general kudos that we get as a result. If your name is known in the OPDM you tend to have more influence. When we get external auditors coming in to examine whether we are a good council, the people who come know the name of [this authority] and are aware it is an innovator in certain areas. If you are excellent you get more freedom from the controllers in central government. It is a good idea to get known. This year there is Beacon Status for Election Processes which means we also get more money from central government. We will have to mentor other authorities to bring them up to our standard but we also get more money for that.

Increased kudos was not limited to the council as an organisation. Election Officers also believed that they personally benefited from the increased cachet of their organisation, as one said, 'It has not done my career any harm'. Another allowed that, as an Election Officer for a Beacon authority, he would gain personal kudos and possible career enhancement as he mentored other councils, saying, 'The council is seen as a leader and the senior officers are viewed as progressive'.

The 2003 non-pilot authorities did not appear to harbour any ambitions regarding increased status. As the pilot schemes were voluntary, Election Officers in the non-pilot authorities did not believe that they or their councils would lose status by not taking part. Those officers considered it a matter of pride to conduct a well-run traditional election and regarded the complications of organising a parallel e-election and traditional election with scant resources as a threat to the conduct of the ballot as discussed below.

In 2007, Election Officers in authorities that joined the pilots claimed their motive to join the trials was not an increase in status; rather it was to give the public a greater choice of voting channels. They appeared enthusiastic to try the new technology although they did not recognise a 'need' for the new voting methods, mirroring claims of pilot officers in 2003. The main reason Officers did not join the 2007 trials was again a lack of funding to manage the increased workload. In 2007 this entailed preparing for or embedding new working practices following restructuring and fulfilling the obligations of the *Electoral Administration Act* (2006) which had been a potential concern discussed in earlier interviews including that with the representative of the AEA. Election Officers in non-pilot authorities concluded that the amount of work to conduct a pilot in addition to the increased administrative burden would be too great. An officer commented on senior management changes saying:

> There was a staff change in 2006 with the introduction of a brand new section. I was the only member of staff left with any experience of elections so I had to set-up the new department, recruit and train a new team and get to grips with the Electoral Administration Act. I could not cope with an electoral pilot in 2007.

6.5.2 Policy Design and Implementation

The second major influence against local e-voting adoption was the former UK government's approach to policy design and implementation. Its 'top-down' implementation approach appeared to isolate Election Officers, as it effectively ignored input from those local officers who control and are responsible for all conduct of elections. They had not contributed to the design of the policy, and despite the trials being an information-gathering tool, Election Officers who had submitted their evaluation reports of pilot schemes to the Electoral Commission believed that their recommendations for improvements had been ignored. As discussed above, Officers in authorities that did not join the trials were not offered opportunities to explain their reasons for non-participation.

In both series of interviews, there was a consensus that the time between volunteering for a pilot, completing the necessary legislative procedures and issuing the orders was too short. Election Officers in pilot authorities explained that the formulation of the application and the amending of the Statutory Orders to cover the exact provisions of the pilot took longer than expected. Since e-voting was conducted in conjunction with conventional voting methods, the usual election preparations were also being arranged so late permissions establishing the type of pilot procedures resulted in extra strain on already fully committed election departments. An Officer in a 2003 pilot authority explained 'You literally only have a month to get the application in and it's a huge lot of work'. Confirmation that preparatory procedures continued to cause problems in subsequent pilots was offered by an Election Officer in 2007. He said, 'It's a difficult situation. I only have staff and finance for a traditional election. There's just too much to do'.

As the pilot programme evolved, testing had become increasingly targeted at specific types of voting innovations, a strategy that had inhibited pilot participation. In the case of e-voting adoption decisions, local authority culture could be subsumed by central government objectives. Once local authorities agreed to take part in the pilot schemes, they ceded authority to central government. Local authorities then became agents for the government and had little discretion in the type or conduct of the pilot schemes. Central government overtly allowed discretion in the decision to join the pilots while at the same time restricting that discretion by targeting the pilots and resources.

6.5.3 Beliefs and Values of Election Officers

A further major influence against the adoption of e-voting was the beliefs of Election Officers. At the 'critical stage', shown in Fig. 6.1 above, when the implementation of e-voting passed from central to local government, evidence suggested that the perceptions and assessments of the key actors, the Election Officers, were in most instances decisive.

In 2003 and 2007 data demonstrated the practical role of the Election Officers in leading decision-making on e-voting adoption. Election Officers, either in their roles as an individual decision-making unit, change aides, or in their organisational role as champions or 'anti-innovation' champions, acted as gatekeepers leading their authorities' decision regarding participation in the trials (Rogers 2003:414). As one Election Officer said, 'I make the decision in consultation with the Chief Executive whether we think there is any merit in doing it. If we do not it stops at that point. We act as gatekeepers'.

6.5.4 Security Issues

System integrity remained influential in both 2003 and 2007. The influence of breaches of security during the 2003 pilot schemes resonated through the years and influenced against 2007 pilot participation. The executive from the AEA stated that he would not recommend e-voting unless there were 'copper-bottomed' guarantees on security.

In 2003, the technology had, in some cases, proved to be unreliable and the affected local authorities did not wish to risk any threats to future ballots. The same authorities had experienced problems with their contractors who failed to appreciate the obligations and timescales of electoral legislation. In one authority there had been problems with the postal vote-checking system as the officer explained, 'The software caused problems as it collated the results. The technology just refused to talk to each other'.

The 2007 non-pilot authorities' experiences of the 2003 pilots had influenced against further pilot participation. Officers in the 2007 non-pilot authorities believed that the technology was not fit for purpose and posed a risk to the security of the ballot. In 2003, they had experienced problems with the technology especially e-counting and posited that such incidents resulted in doubts regarding the validity of the ballot results. They were not willing to join any further trials until there had been substantial investment to address system security.

In contrast, Election Officers in 2007 pilot authorities were not influenced by problems encountered in 2003, even though they had heard and read reports of previous pilots. Each officer had received information from a range of sources including his network of local, district and national contacts, enabling him to assess the advantages and disadvantages of the new voting methods thereby treating past pilots as learning opportunities. They were confident that measures were in place to prevent fraud, as only 5 of the 12 authorities were using electronic means of casting a vote. The remainder were trialling administrative procedures.

6.6 Discussion

A pilot programme is appropriate to introduce an innovation into organisations, such as local authorities (JISC 2011). However, local authorities have diverse characteristics and the value of trials is questionable, since it cannot be assumed that the

lessons from one set of trials can automatically be transferred to other situations (Pettigrew et al. 1994).

The research supported Downs (1957), Dolan et al. (2010) and the RFT (2006) identifying as a major driver for the adoption of a new practice, the self-interest of bureaucratic personnel and politicians. The main reason that Election Officers volunteered for the pilot schemes was to increase their organisational and personal status. It was apparent that some pilot authorities viewed e-voting as a means to an end. For the 2003 pilot Election Officers, participation in e-voting was a way to obtain the advantages of Beacon Status including freedom from government controllers. This appeared to be a paradox, as innovation within an organisation increases risk, so it could have been expected that to reduce risk, there would have been an increase in central monitoring of the pilot authorities.

Prior research identified the context into which a policy is introduced as instrumental in its voluntary adoption (Hill 2005; Rose 2005; Sobh and Perry 2006). The major influence against pilot adoption was a lack of resources to create a receptive context. The e-voting policy lacked adequate policy tools, described by Rose (2005:17) as 'the stuff of public policy', to promote a sympathetic atmosphere to enhance the likelihood of adoption. Election Officers in non-pilot authorities were not willing to risk the conduct of the traditional ballot by holding an e-election without additional staff and finance. Concern has been expressed that too often central government imposes additional policy obligations on local government without providing the necessary policy tools (Hill 2005).

The normalisation theory helps to understand and explain the former UK government's implementation approach to e-voting, although this research indicated that reliance on normalisation as an approach to introduce e-voting was not realistic. The policy design was incremental, introducing e-voting in addition to traditional voting methods. However, data from the 2007 non-pilot authorities indicated that this type of approach was not minimising resistance to the policy as suggested by Lindblom and Woodhouse (1993); rather it supported Armstrong's (2009) argument regarding resistance to new policies.

The former government reasoned that as electronic transactions became the norm, an increase in the number of voting methods would encourage an increase in voter numbers. However, the causal theory underpinning the policy approach was flawed. Prior research demonstrates that it is not the voting methods that discourage citizens from voting, it is the public sense of alienation from political life. Since 2003, public distrust of political structures and politicians has grown fuelled in 2009 and 2010 by the scandal of MPs expenses, and now it appears that this mistrust pervades all aspects of the political sphere. The Coalition government is considering the system for allowances and expenses for the current Parliament. It remains to be seen whether politicians will amend their self-serving attitudes rather than, as Downs (1957) and the RFT (2006) argue, act for themselves.

Koussouris et al. (2011) argue that there would be greater voluntary participation in policies if individuals believed their input was valuable. Central government's 'top-down' implementation approach appeared to isolate Election Officers, as it effectively distanced central government from local government. Election Officers had not contributed to the design of the policy, and despite the trials being an

information-gathering tool, Election Officers who had submitted their evaluation reports of pilot schemes to the Electoral Commission believed that their contributions were tokenistic. Officers in authorities that did not join the trials were not offered opportunities to explain their perspectives on the voting trials.

Data suggested that the importance of the role played by Election Officers in policy adoption was underestimated by central government. Evidence from the research demonstrated that the perceptions and assessments of these key actors were in most instances decisive. This finding supported Fairweather and Rogerson (2002) who hold that Election Officers and other senior officials wield the greatest power over decisions regarding electoral processes. It also supported Lindblom and Woodhouse (1993) who argue that Election Officers filter information, as seen in their gatekeeper role. In 2007, as in 2003, there was no attempt by the Change Agent (until 2007 the ODPM, then the Ministry Of Justice) to enhance the likelihood of e-voting adoption by the provision of targeted incentives to secure new pilot participants or maintain the loyalty of previous pilot participants.

A major influence against e-voting adoption was the security risks endemic in the new voting methods. The new voting methods must offer at least the same levels of security as the traditional method to ensure that the public have confidence in the new system (ICAVM 2002). However, the UK government had not fully appreciated the level of concern over security issues and therefore had not adequately addressed them to secure an increase in the numbers of authorities joining the pilots.

Despite these warnings, in 2003, prior to the pilot scheme, the government argued that there was no evidence that e-voting led to an increased risk of fraud or undermined the safety and security of the vote. It placed the responsibility for e-voting electoral security onto local authorities and their software providers. In 2007 it rejected the Electoral Commission's conclusions that 'the security risk involved was significant and unacceptable' (Electoral Commission 2007b:85). It acknowledged concerns but believed further pilots were necessary to test scalability and it intended to build on the existing security arrangements (GR 2007). By 2009 it had performed a volte-face halting the pilots due to the security implications.

This research demonstrated that although the problems were not insurmountable, they required government will and action to address them. The following section discusses broad lessons drawn from the research which may be used to better inform policy revisions to address adoption-blocking mechanisms, thereby enhancing the likelihood of the voluntary adoption of e-government policies.

6.7 Conclusion: Learning from the e-Voting Pilots

This final section fulfils the aim of the chapter drawing on the research results to suggest seven lessons drawn from the case studies. From a realist stance, the lessons are generic mechanisms affecting the operation of choices regarding policy adoption. The section argues that issues concerning the causal theory, contextual issues, and policy design impact on the acceptability of policies introducing technology for

voluntary adoption. These variables can act either as mechanisms blocking the implementation of such policies or can be adjusted to enhance the likelihood of policy adoption.

Public policies need to be based on the correct causal theory or the policy will not address the correct policy problem. The UK central government failed to recognise that the causal theory underpinning the introduction of e-voting was flawed. Increasing the ways of casting a vote will not address the public's alienation from the political sphere (Roberts 2010; RFT 2006).

Beliefs and values of the target group influence innovation diffusion, and organisational adoption decisions are predicated on the actions of people within the organisation. The target group of the e-voting policy was local authorities. The paradox is that individuals working within local democratic structures and entrusted to oversee the diffusion e-voting had the power to prevent its adoption. The few who adopted the new voting methods did so for motives different than those envisaged by central government. The provision of an incentive to adopt e-voting, albeit unintended, in that central government did not design the rise in status inherent in Beacon Status as such, proved a powerful adoption driver. However, any perceived rise in status wielded insufficient weight to ensure a tipping point for e-voting adoption.

Expected policy objectives should be clear. The e-voting policy lacked direction despite recommendations for a clear strategic direction and 'road map'. The objective of e-voting veered from widening participation, to widening access, to strengthening voting processes. This lack of clarity impacted on Election Officers' perceptions of the new voting methods.

Policy design plays a significant role on its acceptability. There are limits to the extent to which policy implementation can be structured from the top-down. The 'top-down' managerial design of the e-voting policy allowed limited local discretion. Rather than granting and funding the type of pilot requested by local authorities, central government sought to control aspects of local action. It targeted the type of pilot and provided lists of preferred contractors. This research supports Sorgaard (2004) who recommends that central government put in place mechanisms to introduce innovation that cannot be interpreted as an attempt to seize power.

Linked to policy design is the need for an effective policy evaluation strategy. There appeared to be a major limitation in the UK government's evaluative process as it failed to explore the impact of e-voting on the wider target community as recommended by Dye (2002), Eason (1998) and Hertting and Verdung (2012). The government needs feedback from policy evaluation to act as a 'self-adjusting mechanism' to provide information to improve and revise policies (Minogue 1993:23). During the formulation of a policy for voluntary adoption introduced through a pilot programme, information from non-pilot participants can be valuable to address potential barriers to adoption.

Public policy implementation is within the control of policymakers. Insights into the variables discussed in the preceding sections indicate that the process of policy implementation is influenced by variables within the policy context. However, the former UK government failed to appreciate the influence of local authority contexts on the adoption of this innovation. The e-voting policy lacked adequate policy tools

to promote a supportive atmosphere to enhance the likelihood of adoption. The introduction of any new method of operation results in changes within an organisation in terms of procedures and structures, and many within organisations reject changes when they realise the radical effect on the organisational structures (Serour and Henderson-Sellers 2002).

New systems must be trustworthy. When a new system replaces an established practice, the new system must be perceived as secure as the old system. Election Officers were aware of irregularities during the conduct of e-election campaigns and breaks in the systems delivering e-voting. Their fears had resonated through the years and were one reason for falling numbers of pilot participants. The public need to be convinced of the probity of the new system as they are already disillusioned with the political sphere and do not trust politicians, or they may refuse to cast their vote leading to larger falls in electoral turnouts.

The UK central government appears to have recognised the failure of the e-voting initiative. There has now been a significant shift in the UK government's approach to the use of digital technology with the 2012 initiative 'Digital by Default'. The second aspect of e-democracy, e-voting, as discussed above, is no longer part of the strategy as the Coalition government is looking for new ways of engaging with the public through the use of digital channels (Hill and Notti 2009). The focus is now on transactional services such as applications, tax and licensing rather than new channels of casting a vote (Cabinet 2012). For the first time, the UK government is focusing on the citizen as a customer by building user-centred channels (O'Reilly 2012). Nevertheless, it is expected that the Civil Service will use social media as a listening post to offer real-time information and consult on policymaking. The government is developing a range of tools to guide civil servants on how best to engage through online consultations as central government believes that improved engagement and consultation has the potential to transform democratic participation (Cabinet 2012).

Variables influencing the acceptability of policies introducing technology are mechanisms that either promote or discourage adoption. Evidence-based policy design has the potential to address these policy-blocking mechanisms transforming them into mechanisms that enhance the likelihood of policy adoption. This in turn delivers the opposite effect of Bardach's interpretation of the policy process, producing a game where everyone can play (in Pressman and Wildavsky 1984).

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Chapter 7
Measuring e-Government Efficiency from the Perspective of Implementers: The Case of e-Budgeting in Mexico

Gabriel Purón-Cid

Abstract Several studies on e-government have found that from different stakeholders' standpoints, the nature of efficiency is complex and multidimensional. This study explores the multiple dimensions of e-government efficiency as a goal for e-government adoption, but from the perspective of those inside of government responsible to implement and adopt it. A confirmatory factor analysis was conducted to uncover the multiple dimensions of e-government efficiency from the perspective of implementers inside of government. The data come from a questionnaire applied over government officials who participated in a contemporary case of e-budgeting. The questionnaire includes inquiries about different dimensions of e-government efficiency found in two bodies of literature: information systems and budgeting. The results indicate a more complete structure of e-government efficiency than only the technical and economical aspects of this type of projects. The main motivation of this study is to extend our understanding of multiple dimensions of efficiency in e-government as possible outcomes during e-government adoption from the public administrators' view. Derived from the analysis, some practical advice is suggested.

7.1 Introduction

Efficiency is one of the most common drivers for e-government initiatives (Chan et al. 2008; Heeks 2006; Puron-Cid 2010; Scholl 2009). The term "efficiency" in e-government has launched a continuous search for proper dimensions and measurements (Heeks 2006). This chapter reviews these dimensions and claims that in order to understand e-government efficiency, it is necessary to understand the

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context in which these types of initiatives are developed and operated. In particular, e-government projects are usually embedded in collaboration among participants from different disciplinary fields and areas. Therefore, two bodies of literature, information systems (IS) and budgeting, were reviewed to identify these dimensions. Therefore, this study attempts to answer the following research question of this paper: What dimensions of efficiency are implied in e-government adoption? In order to answer this question, the chapter examines the case of an e-budgeting initiative in Mexico as a case study to examine different efficiency measurements in a context of IS applied in budgeting as an interdisciplinary case for e-government adoption. This initiative is known as PbR-SED for its Spanish abbreviation of "Budgeting based on Results-Performance Evaluation System." The initiative has the purpose of transforming the way agencies spend public resources based on performance evaluation using IS as an official repository of this information and as an interaction space among different stakeholders involved in the budgetary process. The PbR-SED represents an ongoing, complex, and government-wide transformation, and its adoption is expected to condense critical aspects for measuring e-government efficiency from the perspective of implementers and two disciplinary perspectives: IS and budgeting.

By using this case, this chapter examines the multiple dimensions of e-government efficiency among actors inside of government who are responsible of adopting the initiative. This case not only helps to understand the role of IS over the structures of efficiency during e-government adoption but also is useful to identify other critical structures of efficiency from the field of budgeting that interact in the same project. The field of budgeting has been subject of several applications of e-government. Various technological tools and IS have been central components of budgeting operations in government because of the intensive informational content and technological use in the budget process (Joyce et al. 2004; Melkers and Willoughby 2001; OECD 2007; Puron-Cid 2012).

This study conducted a confirmatory factor analysis (CFA) to identify the different dimensions of efficiency among actors inside of government responsible of adopting the e-government initiative into their organizational routines based on the answers of the questionnaire over the adoption of this e-budgeting project. The questionnaire was applied over 1,482 federal and state government officials who participated in the initiative. With a response rate of 14.9 % (221 respondents), the goal of the questionnaire was to evaluate a variety of dimensions of efficiency in e-government adoption found critical in the literature, but from the perspective of public officials who adopt the initiative into their work routines. The main motivation of this study is to derive useful results for extending our understanding about the dimensions of efficiency among government officials involved in e-government adoption. The findings of this study are useful to advise the e-government community of practitioners and scholars in developing and management mechanisms towards improving e-government efficiency. In addition, the results of this study are not generalized to all e-government projects since these findings strictly correspond to a particular type of e-budgeting initiative in Mexico. A selection of some "practical advice" is included.

The structure of the chapter is organized in seven sections including these introductory remarks. The second reviews the literature about the multiple dimensions of efficiency in e-government adoption. The third section states this study's research question. The fourth section presents details of the research design and methods. The fifth section details the results of the factor analysis and discussion. The sixth section discusses some "practical advice" resulting from the analysis which we believe are useful for the adoption of e-government. The seventh section provides final conclusions.

7.2 Literature Review

Efficiency is one of the most critical drivers for e-government initiatives and involves different disciplinary perspectives (Chan et al. 2008; Heeks 2006; Puron-Cid 2010; Scholl 2009). This section revises this term from the perspective of two fields—IS and budgeting—due to the nature of the PbR-SED initiative examined for this study. Although other fields may be included for this review, for the purpose of abbreviation only, these two fields were reviewed.

The term "efficiency" in e-government has launched a continuous search for proper measurements (Heeks 2006). The literature in these two fields has coincided on several dimensions for efficiency in this type of initiatives, such as cost savings, improving public service, strengthening accountability, enhancing IT innovation across stakeholders, and advancing other internal management benefits inside agencies such as strengthening management productivity, improving interorganizational collaboration, increasing the use of information in decision-making, enhancing knowledge sharing among participants, and motivating democratic participation.

Cost savings: The necessity "to do more with less" triggers different administrative reforms and e-government initiatives that promote in part some management improvements and cost savings (Chatterjee and Ravichandran 2004; Dawes et al. 1999; Garson 2004; Gartner 2000; Gil-Garcia 2005, p. 30; Gil-Garcia and Pardo 2005; Ingraham 2007; OECD 2003, p. 29). For example, the gain in efficiency has been observed in the case of interorganizational information sharing systems that have achieved certain levels of efficiency by measuring cost savings (Chatterjee and Ravichandran 2004; Elgarah et al. 2005).

Improving public services: There are also examples of measurements focusing on the improvement of efficiency and effectiveness of government services (CBO 1993; Liner et al. 2001; VanLandingham et al. 2005, p. 236). Henadon (1999, p. 672) suggests that agencies take advantage of e-government initiatives along with other performance-based reforms to reorganize operations and restructure its delivery of services in line with the results orientation. A study conducted by the OECD (2003) found that the improvement of service quality is also a success measurement across different IS initiatives. The study identified several IT tools to improve services, such as online portals, targeted customization, e-mail listings, and authentication tools.

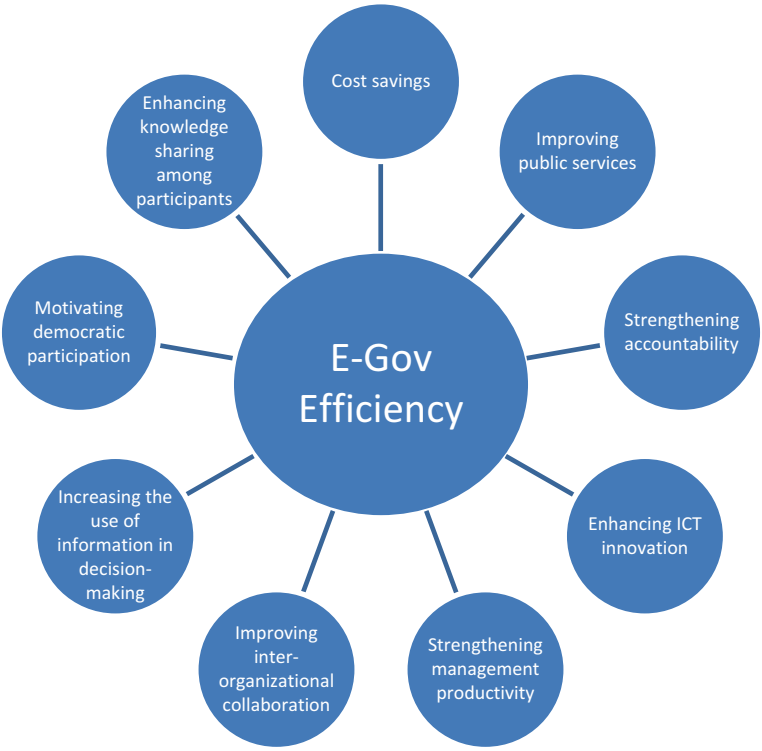

Fig. 7.1 e-Government efficiency dimensions

Gil-Garcia (2005, p. 30) also suggests that governments start to focus on their orientation on customer by utilizing IT to deliver better services.

Strengthening accountability: This topic is now also seen as an effective measurement of e-government efficiency when government provides, for example, useful instruments for accountability to taxpayers (Gil-Garcia 2005, p. 31; Kettl 1998, pp. 1–6; Van Reeth 2002, p. 2). Reformers measure the efficiency of e-government initiatives in terms of how broader is the participation of policy makers, civil society groups, and individuals (World Bank 2008, p. 13). For Rocheleau (2003), "the development of computing technology has had an important impact on measuring accountability and presenting this information to the public" (p. 37). The OECD (2003) also indicates that "information and communication technologies can act as an enabler to engage citizens in the policy process promote open accountable government and help prevent corruption" (p. 45). For Gil-Garcia (2005), public participation and transparency (e-democracy initiatives) and communication exchange between elected officials and citizens are also considered as a success outcome of e-government initiatives (Fig. 7.1) (Davis et al. 2002).

Enhancing ICT innovation: Enhancing IS and communication across different stakeholders is another way to measure the efficiency of e-government. The technological advances of the last two decades have dramatically changed the way performance data can be maintained and examined over time in important government tasks such as budgeting (Melkers and Willoughby 2004, p. 16). To integrate performance information across organizational and management processes, data is gleaned to correspond to different management and stakeholders' uses (Hall and Andrews 2005, p. 257; Liner et al. 2001; Melkers and Willoughby 2004, p. 16). Then, budget and performance information and their supporting systems are developed concurrently with new and changing communication patterns and channels (Joyce 1993). Compared to past reforms, Joyce (1993) found that modern technology supports these initiatives more effectively and efficiently in providing practitioners with more choices in developing, massaging, tracking, and analyzing measures. So, the enhancement of IS and communication across different stakeholders is considered an important success measurement in the budgeting literature. IS has also ushered novel and effective forms of gathering information, thereby enhancing the availability of information for different stakeholders (Clemons et al. 1993; Gurbaxani and Whang 1991) and across the budget process (Joyce 2007; Joyce et al. 2004; OECD 2007; Rasmussen and Eichorn 2000). IS embodies the capabilities to transmit large-volume high-quality data at low cost (Malone et al. 1987; Gurbaxani and Whang 1991; Bakos and Treacy 1986; Clemons et al. 1993) and to enhance storage and processing (Bakos and Treacy 1986). Malone et al. (1987) have termed this as the communication effect of IS. The notion of IS and communication efficiency results in more efficient aggregation and matching of relevant information in government. Therefore, these results are reflected in reduced cost and higher efficiency in IS and communication as success measurements of this initiatives.

Finally, there are multiple *internal management benefits* inside agencies identified in the literature that are considered potential efficiency measurements of e-government adoption. Table 7.1 lists some of these benefits recognized in the literature of IS, e-government and budgeting. In general, the literature agrees in both disciplinary perspectives that these benefits are more evident inside of organizations rather than government wide or at the macro level (Andersen and Dawes 1991; Dawes and Pardo 2002; GAO 1993; Rubin 1990, 1994; Van Reeth 2002).

In order to explore the dimensions of e-government efficiency among actors who participate inside of government, this study argues that it is necessary to consider the different structures and disciplines enacted in practice while adopting a particular e-government initiative. The structures and dimensions of efficiency resulted from e-government projects depend on the type of the initiative and the context in which they are embedded. In this respect, Puron-Cid (2010, 2012) indicates that e-government projects are usually interdisciplinary in nature. The term "interdisciplinary" for this study means "a group of people from different professional backgrounds, knowledge, and expertise usually collaborate for the adoption of the e-government initiative into their work routines" (Puron-Cid 2012).

Table 7.1 Internal management benefits

Internal management benefits	Budgeting perspective	IS perspective
Strengthening management productivity for internal process and streamline agency operations	CBO (1993), GAO (1993, pp. 1–2), Melkers and Willoughby (2004, pp. 60–62), VanLandingham et al. (2005, p. 236)	Benjamin et al. (1984), Danziger and Kraemer (1985), Jenster (1987), Roldan and Leal (2003)
Improving interorganizational collaboration	Melkers and Willoughby (2004, pp. 60–62), VanLandingham et al. (2005, p. 236)	Andersen and Dawes (1991), Benjamin et al. (1984), Danziger and Kraemer 1985, Dawes and Pardo (2002), Gant (2004), Kuan and Chau (2001), Jenster (1987), Roldan and Leal (2003)
Increasing the use of information for decision-making	GAO (1993, pp. 1–2), Melkers and Willoughby (2004, pp. 60–62), VanLandingham et al. (2005, p. 236)	Andersen and Dawes (1991), Benjamin et al. (1984), Danziger and Kraemer (1985), Jenster (1987), Kuan and Chau (2001), Roldan and Leal (2003)
Enhancing knowledge sharing of participants	GAO (1993, pp. 1–2), Grizzle and Pettijohn (2002: p. 54), Kettl (1998, pp. 1–6) Hall and Andrews (2005, p. 257), Melkers and Willoughby 2004: pp. 60–62; Rubin 1990, 1994; VanLandingham et al. (2005, p. 236), Van Reeth (2002, p. 2), World Bank (2008)	Andersen and Dawes (1991), Davis et al. (2002), Gant et al. (2002), Gil-Garcia (2005, p. 31), Luna-Reyes et al. (2007), Macintosh et al. (2002), OECD (2003, p. 45), Rocheleau (2003, p. 37)
Increasing democratic participation	VanLandingham et al. (2005, pp. 234–235)	Soonhee and Jooho (2012)

Source: Adapted from Puron-Cid (2010, 2012)

This chapter sustains that during the implementation of e-government projects, groups of professionals with different backgrounds and expertise usually collaborate. Depending on the type of e-government, Puron-Cid (2010, 2012) suggests to consider other relevant dimensions of e-government from other disciplines that are present when these groups of professionals collaborate in practice that consequently need to be considered in theory. The approach here is to consider the type of e-government project to subsequently analyze the multiple dimensions of efficiency elicited not only from the IS but from other disciplines. The purpose of this study is to consider the interdisciplinary nature of e-government implementation into the study of e-government efficiency from the perspective of those inside of government: public administrators.

7.3 Research Design and Methods

This research applied a questionnaire to a total of 1,482 civil servants from various ministries and government agencies of the federal and state governments. The list of participants was collected from the lists of official training of the PbR-SED initiative provided during 2009 and 2010. 2,048 potential participants were first invited to participate to this electronic questionnaire during the month of June 2011. From these first waves of invitations, only 1,482 e-mails were sent back and valid. The questionnaire was sent using the application of SurveyMonkey. Only 221 questionnaires were completed with a response rate of 14.9 %. There are sections of the questionnaire that reported lower rates of response (in particular the last sections of the questionnaire). This rate is considered normal for questionnaires online (Bryman 2004).

The questionnaire contains 108 questions about different topics. Only a set of 29 questions were designed for the component of efficiency. A 7-point Likert scale for response was used (from "totally agree" to "totally disagree" options). Each question represents an indicator of a particular dimension of efficiency. The questions were designed to operationalize the dimensions of e-government efficiency hypothesized in this study. Table 7.2 details the names of these variables and codes by which they were abbreviated in this study. The questionnaire was applied across different staff members with different levels of responsibility who were involved in the initiative. It is expected that each participant possesses different perspectives about e-government efficiency.

For this reason, the questionnaire registered the opinion of public officials in the areas of budget, IS, management programs, and other areas such as planning, evaluation, management, internal control, and auditing. Figure 7.2 details the participation of different types of staffs in government who participated in the questionnaire. The option "other" registered other ascription. The most common levels of education were undergraduate and graduate level mainly in the fields of accounting, economics, management, IS, law, and various engineering fields. The average age of respondents is 45 (with a minimum of 25 years and a maximum of 69 years). Gender of respondents was reported as 33.6 % women and 66.4 % men.

STATA was used for computing the CFA estimates using the 7-point Likert scale as categorical and ordinal variable for each indicator. Due to the nature of this data, standard methods of performing factor analysis based on a matrix of Pearson's correlations are not adequate. Instead the factor analysis applied a polychoric correlation matrix. In this way, the model is defined by a maximum likelihood procedure in which a cumulative response function for an event is specified by nr which is the frequency of occurrence of the response patterns xr and the probability is represented by $pr = nr/N$, where N is the sample size. Therefore, the probability for a factor of latent (πr) variable is defined by the logarithm of the likelihood function ($\ln L$) as follows:

$$\ln L = N \sum r \, pr \ln \pi r(\theta) \tag{3.1}$$

Table 7.2 Questions, variables, and dimensions

Cost savings	• Indicator 1 (i1-1): The PbR-SED initiative resulted in savings or in cost reduction • Indicator 2 (i2-2): The PbR-SED initiative improved our daily operations in government
Improving public services	• Indicator 3 (i3-13): The PbR-SED initiative improved the delivery of public services • Indicator 4 (i4-14): The PbR-SED initiative resulted in a better orientation towards citizens and beneficiaries of our public programs
Strengthening accountability	• Indicator 5 (i5-7): The PbR-SED initiative helped staff from different areas share their knowledge and information about their management, budgets, and programs • Indicator 6 (i6-20): The PbR-SED initiative provided a framework for better work relationships among different areas of the organization such as planning, budgeting, management, and ICT
Enhancing ICT innovation	• Indicator 7 (i7-8): The PbR-SED initiative helped to develop new IS to be used among different areas and organizations • Indicator 8 (i8-9): The PbR-SED initiative resulted in a better integration of IS from different areas and organizations
Strengthening management productivity	• Indicator 9 (i9-10): The PbR-SED in general was a successful initiative • Indicator 10 (i10-11): The PbR-SED initiative improved the efficiency of the organization
Improving interorganizational collaboration	• Indicator 11 (i11-16): The PbR-SED resulted in a better collaboration between your organization and main controlling agencies such as the ministry of finance and comptroller's office • Indicator 12 (i12-17): The PbR-SED resulted in a better collaboration between your organization and administrative areas
Increasing the use of information in decision-making	• Indicator 13 (i13-27): The PbR-SED initiative resulted in useful information for decision-making of public programs • Indicator 14 (i14-28): The PbR-SED initiative resulted in more use of information for budgetary allocation
Motivating democratic participation	• Indicator 15 (i15-21): The PbR-SED set the basis for more public participation • Indicator 16 (i16-22): The PbR-SED set the basis for more congressmen participation
Enhancing knowledge sharing among participants	• Indicator 17 (i17-5): The PbR-SED initiative helped you to understand better how things work in government • Indicator 18(i18-6): The PbR-SED initiative helped you to understand better how things work in your organization

Note: This is an English translation of the original Spanish version of questions

where

$$\pi r(\theta) = \int \pm \infty \, \pi r(\xi) h(\xi) d\xi \tag{3.2}$$

The estimate considers the sum of all response patterns occurring in the sample (xr) and their corresponding conditional probability (πr) with a distribution function (θ). The conditional probability then captures the commonality (h) and uniqueness

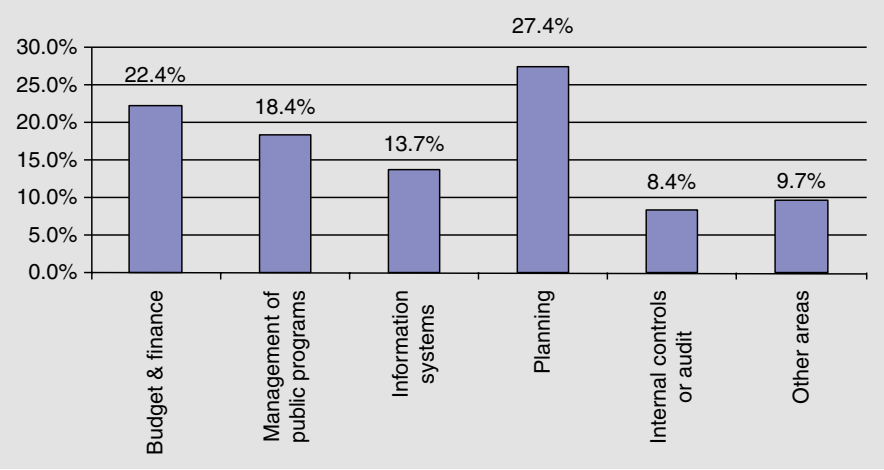

Fig. 7.2 Types of staffs involved in the initiative (206 responses)

(*d*) based on full information of the distribution function in the sample. Instead of maximizing, the goal is to minimize the fit function as recommended by Jöreskog and Moustaki (2001) and Moustaki, Jöreskog, and Mavridis (2004) as shown below (3.3). The function is nonnegative and equals 0 only when there is a perfect fit ($pr = \pi r$ for all r). The minimum value of F is the likelihood ratio X^2 statistic for testing the model against the alternative hypothesis that $\pi r > 0$ and $\sum r \pi r = 1$:

$$F(\theta) = \sum r\, pr\left[\ln pr - \ln \pi r(\theta)\right] = \sum r\, pr \ln\left[pr / \pi r(\theta)\right] \tag{3.3}$$

By applying the equation (3.3) for the "dimensions" of e-government efficiency, the mathematical expression is as follows:

$$\ln L \;\; Efficiency \;\; Latent \;\; Dimension = \sum r\, nr \ln \pi r(\theta) \tag{3.4}$$

where nr is the frequency of occurrence of the response patterns of xr and πr is the corresponding probability of indicators and possible factors (latent dimensions of efficiency). In this study, nine e-government efficiency latent dimensions are hypothesized to be present in the data according to the literature review: (1) cost savings, (2) improving public services, (3) strengthening accountability, (4) enhancing ICT innovation, (5) strengthening management productivity, (6) improving interorganizational collaboration, (7) increasing the use of information in decision-making, (8) motivating democratic participation, and (9) enhancing knowledge sharing among participants.

For computing the CFA model, STATA considers the available data by eliminating incomplete answers in the questionnaire in order to assure certain level of reliability. The analysis also conducted Cronbach's alpha estimates for each question's indicator and the resulted factors for validating internally the questionnaire and

the study's outcome correspondingly. Finally, another source of validation was to estimate the raw data correlation matrix and the correlation matrix between factors in order to compare results and define rotation procedures.

7.4 Results

This section includes a brief section of descriptive statistics, and a discussion of the CFA results of the CFA is presented thereafter.

7.4.1 Descriptive Statistics

The first step of the analysis consisted in analyzing the means and standard deviations of these indicators. Table 7.3 below shows the descriptive statistics for the indicators of e-government efficiency. The first 18 indicators show a similar pattern of centrality between 4 and 5 and similar pattern deviation between ±1.1 and ±1.5. Table 7.4 indicates the polychoric correlation matrix among indicators due to the categorical nature of data. With several exemptions below 40 %, the table presents high correlations between 50 and 90 % among indicators.

Table 7.3 Means and standard deviations

Variable	Obs	Mean	Std. dev.	Min	Max
i1	179	4.396648	1.544905	1	7
i2	179	5.039106	1.42357	1	7
i3	179	4.798883	1.45872	1	7
i4	179	4.759777	1.443059	1	7
i5	179	5.463687	1.312246	1	7
i6	179	5.094972	1.288204	1	7
i7	179	5.24581	1.428412	1	7
i8	179	5.089385	1.419309	1	7
i9	179	4.547486	1.438528	1	7
i10	179	4.631285	1.444993	1	7
i11	179	4.98324	1.383997	1	7
i12	179	5.201117	1.282466	1	7
i13	179	5.067039	1.359931	1	7
i14	179	4.871508	1.437938	1	7
i15	179	4.463687	1.391212	1	7
i16	179	4.206704	1.497849	1	7
i17	179	5.586592	1.405063	1	7
i18	179	5.614525	1.378817	1	7

Source: Own preparation

Table 7.4 Polychoric correlation matrix (179 obs.)

	i1	i2	i3	i4	i5	i6	i7	i8	i9	i10	i11	i12	i13	i14	i15	i16	i17	i18
i1	1.00																	
i2	0.67	1.00																
i3	0.61	0.60	1.00															
i4	0.52	0.55	0.83	1.00														
i5	0.41	0.59	0.54	0.52	1.00													
i6	0.51	0.53	0.73	0.65	0.62	1.00												
i7	0.48	0.61	0.63	0.56	0.66	0.68	1.00											
i8	0.57	0.63	0.72	0.58	0.61	0.72	0.82	1.00										
i9	0.64	0.67	0.81	0.73	0.59	0.70	0.65	0.75	1.00									
i10	0.59	0.65	0.81	0.70	0.49	0.69	0.63	0.74	0.88	1.00								
i11	0.34	0.51	0.54	0.55	0.60	0.53	0.60	0.55	0.58	0.47	1.00							
i12	0.47	0.53	0.63	0.61	0.58	0.68	0.64	0.69	0.68	0.57	0.72	1.00						
i13	0.59	0.62	0.77	0.70	0.54	0.65	0.60	0.66	0.74	0.68	0.57	0.64	1.00					
i14	0.55	0.57	0.75	0.67	0.47	0.57	0.59	0.63	0.73	0.69	0.52	0.57	0.89	1.00				
i15	0.64	0.54	0.72	0.68	0.51	0.75	0.61	0.68	0.68	0.66	0.52	0.61	0.70	0.64	1.00			
i16	0.56	0.44	0.61	0.56	0.38	0.60	0.53	0.56	0.68	0.65	0.56	0.59	0.65	0.61	0.71	1.00		
i17	0.51	0.51	0.46	0.48	0.53	0.47	0.58	0.53	0.58	0.49	0.51	0.55	0.56	0.45	0.48	0.49	1.00	
i18	0.41	0.46	0.47	0.50	0.55	0.52	0.60	0.53	0.58	0.54	0.51	0.56	0.51	0.38	0.47	0.50	0.90	1.00

Source: Own preparation

Table 7.5 Eigenvalues of the unrotated factor model (179 obs.)

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	11.02735	9.94705	0.8028	0.8028
Factor2	1.0803	0.49357	0.0787	0.8815
Factor3	0.58673	0.12277	0.0427	0.9242
Factor4	0.46396	0.07915	0.0338	0.958
Factor5	0.3848	0.06902	0.028	0.986
Factor6	0.31579	0.07904	0.023	1.009
Factor7	0.23674	0.0301	0.0172	1.0262
Factor8	0.20664	0.13756	0.015	1.0413
Factor9	0.06908	0.0304	0.005	1.0463
Factor10	0.03869	0.05865	0.0028	1.0491

Source: Own preparation

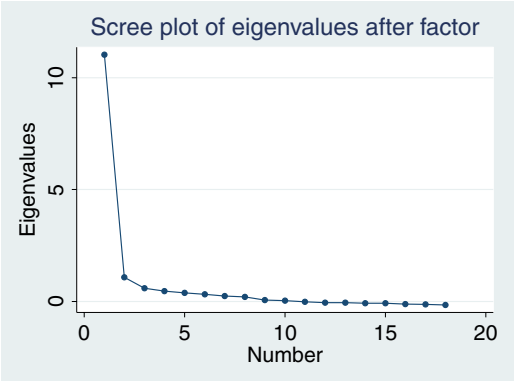

Fig. 7.3 Scree plot of the unrotated factor model

7.4.2 Factor Analysis

The study continues computing the CFA using the polychoric correlation matrix instead of the standard Pearson's matrix. The first evaluation of factors consists in analyzing the eigenvalues. According to Kaiser, Hunka, and Bianchini (1971), only factors with an eigenvalue greater than one are meaningful. This method is called Kaiser test. Table 7.5 provides the eigenvalues generated by the unrotated estimation. This statistic shows that first factor presents an eigenvalue of 11.02 and accounts for 80.28 % of the common variance among the ten indicators. The second factor comes with an eigenvalue of 1.08 and accounts for 7.0787 % of common variance. These two factors embrace 88.15 % cumulative variance in this dataset.

An alternative method for capturing relevant common variance is the Kaiser test which is a graphical approach. It is also called Scree plot. This technique determines the number of meaningful factors by considering the ones above the flat line (Cattell, 1966). Figure 7.3 shows the Scree plot graph confirming the presence of two factors as well. This graphical analysis indicates that two factors load heavily and then the rest of factors remain flat. The first two factors aggregate the different dimensions of e-government efficiency.

Table 7.6 Factor loadings and unique variance of the unrotated factor model (179 obs.)

Variable	F1	F2	F3	F4	F5	Uniqueness
i1	0.6931	–0.1101	0.2437	–0.2383	0.0588	0.3032
i2	0.7352	0.0089	0.0286	–0.2809	0.2508	0.2832
i3	0.8642	–0.2669	0.0099	0.0062	–0.0693	0.1197
i4	0.7956	–0.1636	0.0306	0.1220	–0.0697	0.2258
i5	0.6937	0.2310	–0.2481	–0.0700	0.1367	0.3447
i6	0.8109	–0.0370	–0.2020	–0.0227	–0.2153	0.2152
i7	0.7961	0.1763	–0.2456	–0.1336	0.0568	0.2087
i8	0.8404	0.0062	–0.2113	–0.2053	–0.0030	0.1585
i9	0.8955	–0.1049	0.0762	–0.0869	–0.0611	0.1149
i10	0.8460	–0.1921	0.1112	–0.1845	–0.1572	0.1091
i11	0.6969	0.1770	–0.2423	0.2559	0.0954	0.3018
i12	0.7845	0.1218	–0.2206	0.1686	–0.0187	0.2598
i13	0.8522	–0.1830	0.1399	0.2049	0.2277	0.1047
i14	0.7993	–0.3036	0.1191	0.1833	0.2623	0.1208
i15	0.8102	–0.1557	–0.0035	0.0399	–0.1755	0.2101
i16	0.7377	–0.0857	0.1132	0.1800	–0.1920	0.2879
i17	0.6970	0.5444	0.3090	0.0335	0.0327	0.1152
i18	0.6910	0.5801	0.2249	0.0418	–0.1150	0.1065

Source: Own preparation

The next step of the CFA is to analyze the factor loadings (patterns) which are actually probabilistic correlation coefficients. The closer to ±1, the more highly correlated an indicator is with the factor. Table 7.6 provides the solution for the unrotated version. For the purpose of presentation, only the first five factors are shown since the rest of factors shown not to be significant. By using the unrotated version, the interpretation of the first five factors' patterns presents no clear solution for the different dimensions of e-government efficiency suggested in the literature. All indicators (i1–i18) heavily load the first two factors (F1), making difficult the analysis of e-government efficiency dimensions. All indicators indicate low levels of unique variation between 10 and 30 % that is caused by something else different from these indicators' variation.

Table 7.7 shows the squared multiple correlation (SMC) of indicators. The SMC also demonstrates that all indicators are highly correlated with each other (above 60 %). Therefore, the loading structure of the unrotated version is not suitable for representing the dimensions of e-government efficiency.

Table 7.8 shows the raw residuals of correlations between observed and fitted estimates showing almost in all cases zero correlation. This is evidence that after factor estimation, the uniqueness is orthogonal (zero correlation) and that there are not other significant dimensions of e-government efficiency in this dataset that need to be captured in the model. However, the analysis need to analyze correlation nature between factors estimates with the purpose of identifying potential orthogonal or oblique relations between factors for applying possible rotation techniques.

Based on the polychoric correlation matrix detailed in Table 7.4, the 18 variables are highly correlated with each other. Therefore, an oblique solution is best

Table 7.7 Squared multiple correlation of the unrotated factor model (179 obs.)

Variable	SMC
i1	0.6502
i2	0.6696
i3	0.8440
i4	0.7439
i5	0.6151
i6	0.7449
i7	0.7588
i8	0.8026
i9	0.8599
i10	0.8579
i11	0.6462
i12	0.7038
i13	0.8667
i14	0.8507
i15	0.7423
i16	0.6681
i17	0.8517
i18	0.8590

Source: Own preparation

prescribed when the relationship between factors is significant. At this point of the analysis, it was identified that the unrotated factor model resulted into a loading structure supporting the presence of only two factors. This two-factor structure indicates certain level of consistency of the dimensions of e-government efficiency proposed in this study, but it does not capture clearly the different dimensions identified in the literature. Therefore, an unrotated version is not useful to reveal the dimensions of e-government efficiency. The CFA then has the option to rotate the axes with the purpose of getting a better fit. This study then proceeds to apply the promax rotation assuming an oblique relationship between factors identified previously in the polychoric correlation matrix among variables used in this dataset. Due to the oblique relationship between factors identified in the unrotated version estimation, a promax rotation solution is a better estimation for the dataset. Table 7.9 presents the eigenvalues for ten factors using the promax rotation solution. The promax version provides a clearer factor loading structure (see Table 7.10). Indicators i1–i2 loaded heavily on Factor 1 (F1) showing evidence of the dimension of cost savings. Indicators i3–i4 weighted significantly on Factor 2 (F2) presenting evidence of the dimension of improving public services. Indicators i5–i6 integrated Factor 3 (F3) as evidence for the dimension of strengthening accountability. Indicators i7 and i8 loaded meaningfully on Factor 4 (F4) as components of the dimension of enhancing ICT innovation. Indicators i9–i10 weighted on Factor 5 (F5) as representative of the dimension of strengthening management productivity. Indicators i11 and i12 encompassed Factor 6 (F6) as the dimension of improving interorganizational collaboration. Indicators i13 and i14 embraced Factor 7 (F7) as representative of the dimension of increasing the use of information in decision-making. Indicators i15 and i16 formed Factor 8 (F8) considered part of the dimension of democratic

Table 7.8 Raw residuals of correlations (observed vs. fitted) (179 obs.)

	i1	i2	i3	i4	i5	i6	i7	i8	i9	i10	i11	i12	i13	i14	i15	i16	i17	i18
i1	0.00																	
i2	0.04	0.00																
i3	0.01	−0.01	0.00															
i4	0.00	0.00	0.03	0.00														
i5	0.00	0.02	0.00	0.00	0.00													
i6	−0.01	−0.01	0.01	−0.01	0.03	0.00												
i7	−0.01	0.01	0.00	0.00	0.01	0.00	0.00											
i8	0.00	0.00	0.01	−0.01	−0.01	0.00	0.03	0.00										
i9	0.01	−0.01	0.00	0.00	0.02	0.00	−0.01	0.01	0.00									
i10	−0.02	0.02	0.01	0.00	−0.01	0.01	0.00	0.01	0.02	0.00								
i11	−0.03	0.02	0.01	0.01	0.02	−0.02	0.01	−0.01	−0.01	−0.01	0.00							
i12	0.01	−0.01	0.00	0.00	−0.02	0.02	−0.01	0.02	0.01	−0.01	0.03	0.00						
i13	−0.01	0.01	0.00	0.00	0.00	0.01	−0.01	0.01	−0.01	−0.01	0.00	0.00	0.00					
i14	0.00	−0.01	0.00	0.00	0.00	−0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.03	0.00				
i15	0.02	−0.01	−0.01	0.02	0.00	0.02	0.00	0.01	−0.01	−0.01	0.00	−0.01	0.00	0.00	0.00			
i16	0.02	−0.02	−0.01	−0.01	−0.02	0.00	0.01	−0.01	0.01	0.02	0.03	−0.01	0.00	0.00	0.03	0.00		
i17	0.02	−0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	−0.01	0.00	0.00	0.00	0.00	0.00	−0.01	0.00	
i18	−0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	−0.01	0.00	0.01	−0.01	0.00	0.01	0.03	0.00

Source: Own preparation

Table 7.9 Eigenvalues—refined promax factor model (179 obs.)

Factor	Variance	Proportion
Factor 1	8.29941	0.6042
Factor 2	7.81442	0.5689
Factor 3	7.73283	0.563
Factor 4	6.64022	0.4834
Factor 5	6.2466	0.4548
Factor 6	6.15457	0.4481
Factor 7	5.99371	0.4364
Factor 8	4.4068	0.3208
Factor 9	2.99583	0.2181
Factor 10	2.9876	0.2175

Source: Own preparation

participation. Finally, indicators i17 and i18 loaded on Factor 9 (F9) as being part of the dimension of enhancing knowledge sharing among participants.

The factor pattern of the promax rotation version validates the multidimensionality of e-government efficiency. This multidimensionality is shown in Figure 7.4 which illustrates the ten multidimensions of e-government efficiency using a biplot graph of factors. The correlations between factors computed in the promax rotation version reinforce the idea that the factors' structure is oblique. Table 7.11 shows the correlations between the factors found in the promax solution using the ten factors. The correlations between factors (F1–F10) are high between factors, suggesting that factors are oblique. Finally, Cronbach's α (alphas) were calculated over the set of the 18 indicators that loaded on each factor as measurement of reliability. The Cronbach's α ranges from 0 to 1. The closer to 1, the more reliable the indicators are for the factor model. Table 7.12 shows the Cronbach's α estimated for each model. The results show high level of reliability for indicators in the promax version with high levels of reliability above 75 %. This is an indication that questions applied in the questionnaire were designed properly. The Cronbach's α for the estimated factors differed meaningfully between the unrotated and promax models (0.136 and 0.9136 correspondingly). This means that the average covariance between the factors estimated by promax version is more useful than the unrotated version that assumes an oblique relationship among factors.

7.4.3 Discussion

First of all, the results from this study are not generalized to all e-government projects since these findings strictly correspond to a particular type of e-budgeting initiative in Mexico. So, readers should pay a careful attention to the limitations of this study.

The analysis shows the presence of nine meaningful dimensions of e-government efficiency: (1) cost savings, (2) improving public services, (3) strengthening accountability, (4) enhancing ICT innovation, (5) strengthening management

Table 7.10 Factor loadings and unique variance of the promax factor model (179 obs.)

Variable	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Uniqueness
i1	0.0535	0.0333	−0.0078	0.2415	0.6403	−0.0921	0.0588	0.0187	−0.0614	0.0213	0.3032
i2	0.1574	0.0488	0.1125	−0.0743	0.5888	0.1003	−0.0219	−0.0156	0.1246	−0.0480	0.2832
i3	0.4069	0.2155	0.1119	0.0116	0.0140	0.0015	−0.0267	0.3993	−0.0366	0.0228	0.1197
i4	0.2948	0.1480	−0.0678	0.0514	0.0052	0.1323	0.0619	0.4803	0.0009	−0.0125	0.2258
i5	−0.0140	0.0318	0.2469	−0.0139	0.1199	0.1931	0.0983	0.0086	0.3675	−0.0047	0.3447
i6	0.1903	0.0293	0.2629	0.3555	−0.0930	−0.0198	0.0000	0.0384	0.2637	0.1205	0.2152
i7	0.0185	0.0415	0.7180	0.0513	−0.0095	0.0624	0.1259	0.0116	0.0403	−0.0870	0.2087
i8	0.1983	0.0572	0.6734	0.0004	0.0580	0.0250	0.0038	−0.0446	−0.0362	0.0876	0.1585
i9	0.6509	0.1317	−0.0037	−0.0193	0.0953	0.1104	0.0667	−0.0100	0.0230	0.0768	0.1149
i10	0.8163	0.0741	0.0972	0.0541	0.0274	−0.1074	0.0305	0.0378	−0.0058	−0.0485	0.1091
i11	−0.0373	0.0393	0.0817	0.0653	−0.0151	0.6884	0.0153	0.0510	0.0477	0.0370	0.3018
i12	0.0356	0.0265	0.1644	0.0387	−0.0155	0.5413	0.0632	0.0172	−0.0029	0.2489	0.2598
i13	0.0085	0.8031	−0.0249	0.0690	0.0284	0.0050	0.0921	0.0032	0.0668	0.0386	0.1047
i14	0.1336	0.8593	0.0775	−0.0013	−0.0274	0.0003	−0.0524	0.0071	−0.0381	−0.0442	0.1208
i15	0.0073	0.1061	0.1368	0.5907	0.1220	−0.0256	−0.0297	0.1024	0.0685	0.0036	0.2101
i16	0.1845	0.1178	−0.0445	0.5663	0.0035	0.2010	0.0594	−0.0694	−0.1024	−0.0287	0.2879
i17	−0.0686	0.0774	0.0168	−0.0409	0.1092	0.0100	0.8959	−0.0090	−0.0405	0.0264	0.1152
i18	0.1085	−0.0598	0.0403	0.0309	−0.0927	−0.0138	0.9029	0.0230	0.0589	−0.0248	0.1065

Source: Own preparation

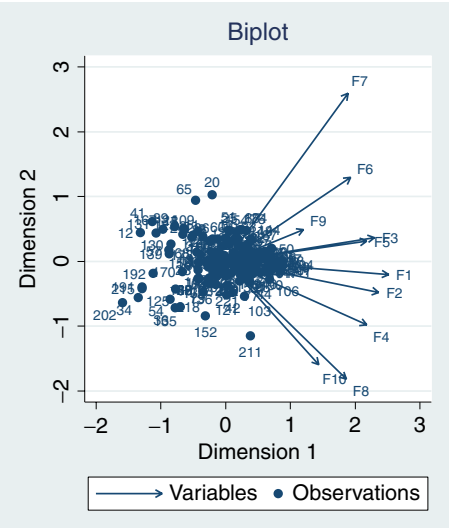

Fig. 7.4 Biplot graph of the promax factor model

Table 7.11 Correlation matrix between factors (179 obs.)

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
F1	1.0000									
F2	0.7251	1.0000								
F3	0.7396	0.6493	1.0000							
F4	0.7200	0.7054	0.6415	1.0000						
F5	0.7187	0.7060	0.6747	0.6160	1.0000					
F6	0.6263	0.6684	0.6844	0.5950	0.5380	1.0000				
F7	0.5546	0.4837	0.5492	0.5208	0.5596	0.6380	1.0000			
F8	0.6041	0.6349	0.5417	0.6197	0.5148	0.4559	0.3119	1.0000		
F9	0.3834	0.3051	0.6365	0.2639	0.3866	0.5620	0.4058	0.5595	1.0000	
F10	0.6001	0.5282	0.6209	0.8109	0.4804	0.3849	0.2853	0.7262	0.4104	1.0000

Source: Own preparation

productivity, (6) improving interorganizational collaboration, (7) increasing the use of information in decision-making, (8) motivating democratic participation, and (9) enhancing knowledge sharing among participants. Although the dimensions of improving public services and strengthening accountability are significant, they show lower factor scores comparatively speaking with the rest of dimensions. In general, this multidimensional factor structure is consistent with the dimensions discussed in the literature.

In terms of cost savings, these results confirm that measuring efficiency in terms of "to do more with less" is a significant dimension for e-government efficiency as proposed by various authors in the literature (Chatterjee and Ravichandran 2004; Dawes et al. 1999; Garson 2004; Gartner 2000; Gil-Garcia 2005, p. 30; Gil-Garcia and Pardo 2005; Ingraham 2007; OECD 2003, p. 29). The dimensions of improving

Table 7.12 Reliability indicators for each factor model

Factor	Factor name	# of vars on scale	Cronbach's alpha
Unrotated model (10 indicators)			
i1–i18	E-government efficiency indicators	18	0.9585
F1a–F2a	Unrotated factors	2	0.136
Promax rotated model (10 indicators)			
F1	Cost savings	2 (i1–i2)	0.7531
F2	Improving public services	2 (i3–i4)	0.8816
F3	Strengthening accountability	2 (i5–i6)	0.7591
F4	Enhancing ICT innovation	2 (i7–i8)	0.8809
F5	Strengthening management productivity	2 (i9–i10)	0.9199
F6	Improving interorganizational collaboration	2 (i11–i12)	0.8031
F7	Increasing the use of information in decision-making	2 (i13–i14)	0.9210
F8	Motivating democratic participation	2 (i15–i16)	0.8075
F9	Enhancing knowledge sharing among participants	2 (i17–i18)	0.9160
F1–F9	Promax rotated e-government efficiency factors	9	0.9136

Source: Own preparation

public services and strengthening accountability proved to be meaningful for measuring efficiency of e-government initiatives, but further studies should be conducted due to the low scores in this study. These two dimensions are considered important in the literature for measuring e-government efficiency, and the results of this study showed a significant factor structure for these dimensions but with low scores. Therefore, further studies are needed to confirm the importance of improving public services and strengthening accountability as measures of e-government efficiency. In the case of enhancing ICT innovations, the CFA analysis demonstrated that technological and communication innovations are critical aspects for assessing the efficiency of any e-government project. This finding confirms what in general the literature recommends in this area (see several examples in the IS area such as Malone et al. (1987); Gurbaxani and Whang (1991); Bakos and Treacy (1986); and Clemons et al. (1993), and see also Joyce (2007); Joyce et al. (2004); Melkers and Willoughby (2004); OECD (2007); and Rasmussen and Eichorn (2000) in the budgeting field). Finally, there are multiple internal management benefits inside agencies identified in the literature that were confirmed in this study. The results of this study that corroborate previous findings in the literature mean that the indicators measuring the dimensions of (5) strengthening management productivity for internal process and streamline agency operations, (6) improving interorganizational collaboration, (7) increasing the use of information for decision-making, (8) enhancing knowledge sharing of participants, and (9) increasing democratic participation are critical measurements of e-government efficiency (Andersen and Dawes 1991; Dawes and Pardo 2002; GAO 1993, pp. 1–4; Rubin 1990, 1994; Van Reeth 2002).

All the indicators used in this study and applied in the questionnaire showed high levels of reliability above 75 %. The results of the unrotated model indicate that the group of the 18 indicators applied in the questionnaire loaded more meaningfully on

two-factor structure assuming orthogonal relationships. This structure was no useful to explore the dimensions of e-government efficiency. The results in Table 7.11 indicate high levels of correlation among factors, indicating that a clear oblique relationship between factors and a promax solution was more suitable for this dataset.

Decision-makers, policy designers, and participants of e-budgeting initiatives need to consider the presence of different e-government impacts. So, caution should be paid in order to design the proper tools of measuring e-government efficiency according to the context of the e-government initiative.

Another important result is that the 18 questions included in the questionnaire were reliable indicators for the dimensions of e-government efficiency identified in the literature. All questions were measured using a 7-point Likert scale. So, further studies need to evaluate the difference of conducting factor analysis by comparing different response-measuring designs. Researchers should also exercise caution when interpreting the data collected. In this case, the data were collected using the dimensions of e-government efficiency found in the literature. These questions using the 7-point Likert scale were useful in producing a meaningful dataset to conduct the factor analysis for the purpose of evaluating the multifaceted phenomena of e-government efficiency of this study.

The following section provides some practical advice for a better adoption of e-government related to the multidimensional nature of their efficiency.

7.5 Practical Advice

From the analysis, it is possible to recommend some "practical advice" for enhancing e-government efficiency:

1. Based on the multidimensional complexity of e-government efficiency, designers, decision-makers, and participants of e-government initiatives should plan and establish clearly and in advanced the goals and expected outcomes of their projects. A lack of this clarity of goals or a more ambitious set of goals confuses implementers and participants about the priorities of this type of initiatives.
2. Cost savings, improving public services, management productivity, and ICT innovation are the most common goals for any e-government initiative. However, there are other some other critical outcomes of e-government adoption that should be considered as well such as accountability, collaboration, use of information in the decision-making, participation, and knowledge sharing. Therefore, designers, decision-makers, and participants of e-government initiatives should pay attention to other dimensions of e-government efficiency different from just the technical and economical outcomes.
3. Among the most meaningful factors in this dataset, the increase of the use of information for the decision-making process, knowledge sharing, and management productivity is the most significant. Therefore, designers, decision-makers, and participants of e-government initiatives should consider not only the tools for strengthening management productivity but also the tools to enhance the usefulness of information and knowledge sharing in e-government projects.

Future studies should extend the central query of this text in terms of examining and assessing the different dimensions of efficiency of e-government initiatives. In this study, the case of e-budgeting was reviewed, but other types of projects need to be evaluated from an interdisciplinary perspective. This is an interest of researchers and practitioners who need better and more accurate measurements of e-government efficiency in research and in practice.

7.6 Conclusions

This paper tested if the set of variables identified in the literature was applied in the e-budgeting initiative in Mexico. The questionnaire applied a set of questions representing each of these variables. This research tested if these inquiries in the questionnaire fairly represent the multiple dimensions of efficiency identified in the literature in a particular case of e-budgeting in Mexico (PbR-SED). This study found that CFA was a useful technique to test the dimensions of e-government efficiency identified in the literature and the soundness and reliability of the questionnaire design based on the multiple dimensions of efficiency found in the literature. First, the analysis allowed researchers to reveal the different dimensions of e-government efficiency from the opinion of different participants of the e-budgeting project. Second, the CFA technique measured the level of reliability of the measurements used in the questionnaire for future applications. The results of the CFA showed a meaningful factor structure of e-government efficiency consistent with the set of dimensions identified in the literature. According to the analysis, nine dimensions loaded heavily: (1) cost savings, (2) improving public services, (3) strengthening accountability, (4) enhancing ICT innovation, (5) strengthening management productivity, (6) improving interorganizational collaboration, (7) increasing the use of information in decision-making, (8) motivating democratic participation, and (9) enhancing knowledge sharing among participants. These dimensions have been found critical in previous studies and suggest that this study validates in some way these dimensions using this e-budgeting case in Mexico.

These dimensions show that e-government efficiency is much more than just technological components suggested from core venues of the information systems field. On the contrary, there are other disciplinary perspectives that helped to understand other dimensions of e-government efficiency. In other words, the development of e-government initiatives involves more than just technical aspects such as defining strategies and goals towards cost savings, improving public services, strengthening accountability, and enhancing ICT innovation. Furthermore, several internal management benefits were also revealed. In other words, participants of e-government had to understand not only the information and technology, cost savings, and productivity aspects of the project but also other components of the initiative such as public services, accountability, innovation, collaboration, decision-making, participation, and knowledge sharing.

Reformers and designers of e-government should recognize the different perspectives of e-government efficiency from different participants in the initiative in

order to facilitate the consolidation of e-government impact in the organizations and public services. This study also brought in the table the perspective of different actors who participated in the adoption of the e-budgeting project in Mexico. It was clear that not merely IS staff was involved, but other professionals and actors interacted in this type of e-government project.

Further studies need to evaluate other possible dimensions of e-government efficiency of the unexplained variance. Other future efforts may improve this study in terms of its CFA application or by including other dimensions found critical or meaningful in the literature. In this case, the dimensions included in this study came from an interdisciplinary review of two bodies of research: budgeting and IS. Perhaps, other studies may extend it with other disciplinary perspectives: management, organizational studies, psychology, sociology, etc. The importance of improving this study presents challenges in terms of method and theory that future contributions may be building on.

Finally, this study presented several limitations. First, cautionary warning needs to be announced: the results of this study are not generalized to all e-government projects since these findings strictly correspond to a particular type of e-budgeting initiative in Mexico. The CFA was very useful and served as a tool for uncovering the possible dimensions of concepts based on the dataset. This is also an important limitation of this study. The dimensions are built from the dataset and their reliability can be tested using certain statistics, but the theoretical reliability depends on how well the questions were designed and other biased issues during the collecting, classifying, and coding may influence the results of this type of analysis.

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Chapter 8
Public Managers' Perceptions of e-Government Efficiency: A Case Study of Andalusian Municipalities

Laura Alcaide-Muñoz, Antonio M. López Hernández, and Carmen Caba-Pérez

Abstract In Spain, various plans to develop the use of ICT have been implemented in order to facilitate procedures related to public services, to promote economic transparency and to improve the effectiveness and efficiency of public administration. Nonetheless, some recent studies have shown that the development and implementation of e-government in Spanish municipalities has taken place very irregularly. Research has provided an external view of the implementation of these initiatives, but to date little is known about the opinions of the people directly involved in their introduction and development. This chapter examines public managers' perceptions of e-government efficiency, determined by means of a survey in this respect addressed to public managers in municipal governments in Andalusia. The results inform us of the perceptions of municipal IT managers in this area of Spain and show how the heterogeneity of their views is accounted for by socio-demographic variables and by political factors.

8.1 Introduction

Information and communication technologies (ICTs) are fundamental to managerial reform in public administration (Chan and Chow 2007), and their use by public administrations—*e-government*—has enabled local, regional and national

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governments to improve their internal managerial efficiency (Pardo et al. 2012) and the quality of public service delivery (Lindgren and Jansson 2013).

In recent years, public administrations have created official websites, viewing e-government as an Internet-driven activity that improves citizens' access to government information, services and expertise, thus enhancing participation and satisfaction with the government (Welch et al. 2005). The Internet is now widely used to access government information via official websites or portals.

Many public administrations use ICT both to facilitate procedures related to public services (Reddick and Turner 2012) and to promote economic transparency, allowing users free, easy and appropriate access to fiscal and economic information (Meier 2013). At all levels of government, administrations are striving to address the challenge of achieving transparency, effectiveness and efficiency, and ICT provide an invaluable means of doing so.

Many studies have examined e-government, focusing on questions such as increased economic and financial disclosure (Caba et al. 2008), the better provision of public services (Lodge and Hood 2012) and enhanced participation, transparency and confidence in the management of resources by public managers (Kim and Lee 2012). However, others have concluded that the outcome, in general, has been disappointing (Bekkers and Homburg 2007), in that while public administrations have indeed developed websites, their efforts to improve public sector services and to provide online government information remain very irregular (Paris 2005).

These differences of opinion reflect the fact that public administration reform is often difficult; among other aspects, it involves diverse stakeholders whose interests frequently diverge, and conflicts often occur (Norris and Reddick 2013). Accordingly, some studies have examined the views of various stakeholders in the adoption and implementation of e-government (Ho and Smith 2001; Garson 2006), while others have analysed the perceptions of city managers regarding privacy and the security of e-government (Edmiston 2002; Garson 2006). Other researchers have focused on the citizen as stakeholder, relating to government through the Internet (West 2004; Welch et al. 2004). In some studies, researchers have asked city managers about their opinions and perceptions of the efficiency of e-government (Streib and Navarro 2005; Reddick and Frank 2007a, b), and recent surveys have reported the perceptions of IT managers on the efficiency of the implementation, adoption and development of e-government (Reddick 2004, 2009; Norris and Reddick 2013). Most of this research has been conducted in the USA, and very few published studies have considered the question of e-government in Spain.

Many studies have highlighted the existence of significant differences in the implementation of e-government and in governance in general, according to the administrative culture in question (Kickert 1997; Pollitt and Bouckaert 2004; Rodríguez et al. 2006). Accordingly, it would be valuable to analyse the efficiency of e-government as applied by Spanish administrations, inquiring into both of these aspects and furthering our understanding of e-government.

In Spain, diverse action plans related to ICT development and the implementation of e-government have been implemented, with the aim of modernising public services, improving public services and promoting the use of ICT (Muñoz and Hípola 2011).

These plans range from the first 'INFO XXI' (2001–2003) to the current 'Digital Agenda' (2013–2015) (Spanish Government 2013). In terms of legislation, Act 11/2007, of 22 June, on electronic access by citizens to public services (Official State Gazette No. 150), recognised the right of citizens to interact with the government by electronic means and aimed to facilitate their access to information and administrative procedures, promoting conditions of confidence in the use of online media, facilitating greater proximity to citizens, enhancing administrative transparency and contributing to improving the functioning of the government, increasing its effectiveness and efficiency through the use of ICT. In short, this legislation was intended to simplify administrative procedures and to provide greater opportunities for participation and transparency, thus contributing to the development of the information society.

Some previous studies have compiled information on e-government strategies applied in Spain (Ruano 2013; Muñoz and Hípola 2011), while others have focused on transparency and the disclosure of financial and economic information (Caba et al. 2008; Serrano et al. 2009; Gandía and Archidona 2008; Rodríguez et al. 2007). These studies provide an external view of the implementation of government initiatives, but have left us unaware of the opinions of the people involved in their introduction and development; the barriers encountered; the financial, material and human resources available; whether government personnel are really aware of the numerous procedural and organisational benefits offered by e-government; or whether the current economic crisis is restricting the development and improvement of this type of initiative.

Therefore, in this chapter, we investigate public managers' perceptions of the efficiency of e-government in medium-large-sized municipalities (with over 20,000 inhabitants) in Andalusia, the largest of Spain's regions. We seek an overall view of IT managers' outlook in this respect, in full awareness that the municipalities examined are of different sizes and present different characteristics; thus, opinions will differ, and this heterogeneity may be accounted for by certain socio-demographic variables and/or political factors.

Our findings should provide public managers and, especially, policymakers with an outlook on the benefits to be achieved from the appropriate implementation of e-government and on what should be done to overcome barriers and reluctance among public employees concerning the implementation of e-government. These results could also help us understand how, despite the progress made in the implementation of ICT, the reform policies undertaken by local governments have been uneven in scope and effect, as a result of which the modernisation achieved is by no means outstanding, in comparison with outcomes elsewhere in Europe (Ruano 2013; Muñoz and Hípola 2011).

The rest of this chapter is organised as follows. The next section provides an overview of the diverse stakeholders in the implementation of ICT by public administrations. We then consider the organisational and legislative context of these administrations in Spain, in general terms, with particular respect to e-government and the Internet. Section 8.4 of the chapter introduces the empirical study; describes the sample selection, the research methodology and the content of the questionnaires addressed to public managers; and then presents the analysis carried out of the findings. In the final section, these results are discussed and the main conclusions drawn.

8.2 Literature Review

In recent years, many public administrations have sought to improve the efficiency of public services by incorporating ICT (Chan and Chow 2007). These reforms have posed organisational and technical challenges, requiring the incorporation of new systems, but the outcome has been enhanced performance, greater satisfaction among citizens, the tighter integration of business processes, support for collaborative decision-making and lower costs of ITC infrastructure, which is both flexible and easy to maintain (Kamal et al. 2011). However, this organisational change has not been propelled by financial reasons, but is more the result of decisions taken by those most organised politically or in control of public organisations (Lindblom 1959).

The efficient, effective integration of ICT has long been a priority objective of public administrations, especially since the introduction of e-government (Beynon-Davies and Williams 2003). The adoption of these systems is a complex process (Lam 2005) that affects all operational activities and numerous internal and external stakeholders, each with their own domain of knowledge, experience and characteristics.

In the latter respect, different types of categories have been proposed. Nutt and Backo (1992) divided stakeholders into primary and secondary, with the former being the fundamental, strategic actors who are directly involved in the implementation of e-government, while secondary stakeholders are those that are not essential to the survival of the public administration (Chan et al. 2003). On the other hand, Kamal et al. (2009, 2011) focused on three main categories: decision takers, management and IT staff. The latter are those specifically involved in the process of ICT adoption and the implementation of e-government. In evaluating e-government, the supply-side perspective should also be considered, analysing the public administration in its role as a supplier of services.

Although it is widely recognised that the different stakeholders in e-government play an important role in its long-term success (Tan et al. 2005), there has been very little comparative analysis of the perspectives of different stakeholders, possibly due to an excessive focus on the supply side and on the implementation of technology (Kosaker and Lee-Kelley 2006).

There is general agreement that the public sector is complex, that it involves a variety of stakeholders and that this complexity is translated into e-government (Rowley 2011). Accordingly, e-government stakeholders should be identified and typologies developed, to respond to diverse stakeholder requirements. Although stakeholder theory has primarily been applied to the private sector, the insights from this area can be applied in part to public sector settings and, in particular, to the context of e-government (Flak and Rose 2005).

Rowley (2011) conducted a literature review of stakeholders in e-government and identified the following categories (Table 8.1).

Different stakeholder groups do not always have the same interests, and so those of each stakeholder category must be identified (Yildiz 2007). In this context, the analysis of the ‘fit’ between supply assumptions and usage drivers is fundamental, through stakeholder identification (Lee-Kelley and Kolsaker 2004).

Table 8.1 e-Government stakeholders

Source	Stakeholder categories
Heeks (2006)	Non-profits, other agencies, citizens/customers, businesses, communities, government
Mintzberg (1996)	Customers, clients, subjects and citizens (constituents for e-government services)
Orange et al. (2006)	Politicians, staff, public, project managers, design developers, other government agencies
UN (2008)	Public administrators, programmers, end users, politicians
Yildiz (2007)	Government, citizens, business, civil society
Beynon-Davies (2005)	Customers, suppliers, partners, employees (general) Large and small businesses, individual taxpayers, students/graduates, senior citizens (for Inland Revenue, UK)
Flak and Nordheim (2006)	Regional council, regional partners, national and international policymakers, systems vendors, county governor, county municipality, citizens of municipality, municipal politicians, municipal administration, municipal service production units (for a local government project in Norway)
Heeks (2003)	Senior managers of the Epidemiology Service, Ministry of Health, internal users (managers, health specialists, statistical specialists, information systems personnel), external users (in various ministries, local authorities, research institutions and international organisations), citizens (computerisation in a national epidemiology service in Central Asia)
Irani et al. (2007)	Informed citizens (academic), elected representatives, local government staff, regional and central staff, others (VIEGO participants)
Millard (2008)	Policymakers, researchers, practitioners, constituents as citizens and businesses (stakeholders in impact measurement)
Tan et al. (2005)	Singapore government, IRAS (Inland Revenue Authority of Singapore), tax officials, taxpayers, employers (e-filing for tax initiative)

Source: Rowley (2011)

Therefore, it is of interest to obtain and analyse the opinions of one of the main stakeholder groups in the implementation of e-government initiatives. In this case, we focus on Spanish government authorities and, in particular, regional bodies in Andalusia (southern Spain), which have been active in implementing e-government initiatives to promote the disclosure of government information, citizens' participation in public affairs and enhanced performance in the provision of public services.

8.3 Organisational and Legislative Context of e-Government

In 2001, Andalusia launched its first ICT modernisation programme, with two main elements—the Master Plan for Service Quality (PLADOCS) and the i@landalus plan of strategic initiatives to develop the information society—by which numerous projects were implemented to accelerate Andalusia's incorporation into this new era, through the balanced deployment of the necessary infrastructure, creating quality e-services and promoting greater awareness of ICT use.

Table 8.2 Legislative framework for e-government in Andalusia

E-administration Stage 1	
I@landalus plan for strategic initiatives to develop the information society 2001–2006	Master plan for service quality (PLADOCS) 2002–2005
Decree No. 183/2003, of 24 June, regulating public attention and information and the online performance of administrative procedures	
Decree No. 72/2003, of 18 March, on measures to promote the knowledge society in Andalusia	
Decree No. 177/2005, of 19 July, on the menu of services and service quality	
Order, 10 June 2005, on online tax registry	
Order, 10 June 2005, on online payment and presentation of declarations	
E-Administration Stage 2	
Information society of plan Andalusia 2007–2010	Andalusian Government strategy for the modernization of public-services 2006–2010
Order, 11 October 2006, on the online issuance of authenticated copies	
Order, 11 October 2006, regulating the use of the e-strategy system in online documentation	
Act No. 9/2007, of 22 October, on government administration in Andalusia	
Order of 20 February 2007, regulating the implementation of and use of the information system for the management of ownership and/or management files by the Andalusian Government (the@rchiveA Andalucía Project)	
Decree No. 68/2008, of 26 February, eliminating the requirement for a photocopy of official identification documents and of the municipal residence certificate in administrative procedures, and establishing a website for the purpose of e-notification	
Order of 22 February 2010, approving the Manual of Administrative Simplification and Streamlining of Administrative Procedures	

Source: The authors

In 2005, spurred by the new European framework for ICT and the Spanish Avanza Plan, the Andalusian government implemented its second ICT modernisation project, known as the Information Society Plan for Andalusia 2007–2010 (ISPA). The aim of this was to achieve a series of strategic IT objectives, affecting the whole of Andalusian society, through four areas of action: Digital Community, Companies for the New Economy, Intelligent Administration and Digital Infrastructure and Context. The area of Intelligent Administration included the strategy for digital public services, to bridge the gap between public services and citizens and companies by the application of online methods and by coordinating the public entities involved in providing these services.

The development and implementation of new ICT by the Andalusian government has greatly improved the quality of services provided and the facilities for attending the public. Using the Internet, many administrative procedures can now be performed, information accessed online and public attention services requested of the regional administration.

The aim of these strategic plans for e-government is to modernise public services, and significant adjustments have led to the adoption of new legislation to incorporate reforms in local and regional governments, in administrative procedures and in procedures for public attention (Table 8.2).

Apart from the above legislation, perhaps the greatest impact on e-government has been achieved by Act 11/2007, of 22 June, on e-Access to Public Services, which recognised the right of citizens to interact electronically with public authorities and the obligation of the latter to ensure the realisation of this right. The Act also sought to promote the use of e-services by creating the necessary conditions and thus indirectly exerted a 'pull' effect on the information society in general.

8.4 Empirical Study

8.4.1 Sample Selection

To achieve our study goals, we sought the opinions of public managers in ICT departments in local authorities in Andalusia (southern Spain). This area was selected because it is the most populated region in Spain, with nearly 8.5 million inhabitants (National Statistics Institute—INE), followed by the region of Madrid, with nearly 6.5 million. Andalusia has 18 % of the total population of Spain and has more inhabitants than some European countries, such as Denmark (5.5 million), Finland (5.3 million) and Ireland (4.7 million). It has a surface area of 87,000 km^2, 17 % of the total area of the country, and is larger than countries such as Austria, Belgium, the Netherlands, Ireland and Denmark. It consists of 771 municipalities (nearly 10 % of the Spanish total), with 240,000 public employees, and the regional budget for 2012 exceeded 32 billion euros, the largest of all the Spanish regional governments.

Andalusia consists of eight provinces—Almeria, Cádiz, Córdoba, Granada, Huelva, Jaen, Málaga and Seville—of diverse characteristics and containing municipalities of different sizes, and so we obtained a study sample representing these different types of municipalities. On the one hand, we focused on those with more than 50,000 inhabitants, because under Local Government Act 7/1985 these authorities are assigned the highest level of competences related to service delivery, and, on the other, on those with 20–50,000 inhabitants (medium-sized municipalities). This splitting of the sample allowed us to compare the perceptions of public managers from two types of municipalities, since there is empirical evidence that population size is one of the main variables underlying differences in perceptions (Moon 2002; Holden et al. 2003; Norris and Reddick 2013).

Andalusia has 81 municipalities with over 20,000 inhabitants (National Statistics Institute—INE) (see Table 8.3), with a total population of 5,724,234 (67.74 % of the population of Andalusia). For this study, we first sought to identify the IT manager(s) in each case by examining the municipal website for a contact number or email address, but this information was only available on one site. Therefore, each municipality had to be contacted directly to request a phone number to get in touch with the relevant person, and all but ten of those contacted by this means provided the necessary information.

In this initial contact, we ensured that our interlocutor was indeed the person responsible for IT, offered him/her a general explanation of the purpose and content

Table 8.3 Municipalities with over 20,000 inhabitants in Andalusia

Province of Andalusia	Number of municipalities	Population	Responding municipalities
Almeria	6	443,038	2
Cádiz	15	1,052,074	7
Córdoba	8	512,059	3
Granada	7	414,815	3
Huelva	6	262,291	2
Jaen	6	299,890	0
Málaga	16	1,395,810	8
Seville	17	1,344,257	6
Total	81	5,724,234	31

Source: National Statistics Institute (INE)

of our survey and requested an email address to send them the online survey. The first mail provided guidance on how to fill in the survey, the corresponding link and a researcher's email and contact phone number for help if any questions arose. This process was carried out in May to June 2013. A total of 31 municipalities (38.27 %) responded to the survey (see Table 8.3). This response ratio was higher than that obtained in similar studies of this nature (Norris and Reddick 2013). The final sample consisted of 12 municipalities with over 50,000 inhabitants and 19 with a population of 20–50,000 inhabitants. This procedure enabled us to obtain information, perceptions and opinions from public managers in a wide range of municipalities throughout Andalusia.

8.5 Methodology

8.5.1 Questionnaire

This research is based on a case study of municipalities in Andalusia, seeking the opinions of public managers involved in the innovation and modernisation of local administrations and inquiring into their perceptions of the development and implementation of e-government in their municipalities. The study was carried out by means of a questionnaire, described below, and was based on a preliminary wide-ranging, detailed review of the literature (Norris and Reddick 2013; Reddick and Frank 2007a, b; Nasi and Frosini 2010; Streib and Navarro 2005; Reddick 2004; Ganapati and Reddick 2012; Norris and Moon 2005; Moon 2005). In particular, the questionnaire focused on certain aspects that may influence the efficiency of e-government, and the respondents were asked to score each one, from 1 to 10:

1. Barriers and factors that may limit the efficiency of e-government in Andalusian municipalities (Table 8.5)
2. The changes that might arise from the development of e-government (Table 8.6)

Table 8.4 Socio-demographic and political variables

Variable	Description	Source
Population	Natural logarithm number of inhabitants in the municipality	National Statistical Institute (www.ine.es)
Age of population	Average age of population by municipality	Andalusian Statistical Institute (www.juntadeandalucia.es/institutodeestadisticaycartografia)
Level of education	Percentage of population with university studies	National Statistical Institute
Access to the Internet	Percentage of households with the Internet	National Statistical Institute
Municipal wealth	Natural logarithm income per capita	Ministry of Economy and Finance (www.meh.es)
Political competition	At the last elections, councillors elected for the party in power/total number of councillors 1 = Political competition 0 = No political competition	Interior Ministry (www.elecciones.mir.es)
Political ideology	Political ideology of the governing party 1 = Left wing 0 = Right wing	Interior Ministry (www.elecciones.mir.es)

8.5.2 Socio-demographic and Political Variables

Empirical studies have shown that environmental characteristics and internal factors have influenced the evolution and development of e-government initiatives (Rodríguez et al. 2011; Pina et al. 2011) and the greater transparency and disclosure of financial information by governments (Caba et al. 2008; Serrano et al. 2009; Gandía and Archidona 2008). Therefore, the views and values of municipal IT managers could also be influenced by internal and external factors concerning the implementation of such initiatives. Recent investigations have concluded that the type and form of government, the population served and the percentage of university graduates among the population can all influence the views expressed by IT managers (Norris and Reddick 2013). Our study goes further and considers socio-demographic variables and political factors that may influence respondents' perceptions (Table 8.4).

Moon and Norris (2005) argue that large public administrations are more likely than small ones to adopt e-government, because they are under greater pressure to find alternative ways to provide public services. In this respect, West (2001) reported that large municipalities are more likely to provide public services online. Moreover, larger governments are better placed to meet the high costs of administrative reform and new equipment (Justice et al. 2006) and are more likely to create their own websites (Weare et al. 1999; Musso et al. 2000). In this regard, previous studies have

shown that population size is one of the key variables impacting on the implementation of e-government initiatives (Moon 2002; Holden et al. 2003; Norris and Reddick 2013).

Population characteristics also influence the adoption, development and evolution of e-government initiatives. The age structure is relevant: according to empirical evidence, younger populations are more open to online public services and make greater use of them (Van Dijk et al. 2008; Reddick 2005; Dimitrova and Chen 2006). Thomas and Streib (2003) reported that young people with better education and professional qualifications are the main users of the Internet, and Hart-Teeter (2003) concluded that university graduates are more likely to take advantage of the possibilities offered by e-government. The educational and cultural level of the population is held to be a key determinant of Internet use (Chaudhuri et al. 2005; Gong et al. 2007), because accessing the Web requires some technical knowledge and the skills to seek and interpret information and make use of the applications offered (Mossberger et al. 2004; Kim 2007). Therefore, persons with higher levels of education, and who are thus better equipped to make use of government information, will urge governments to make it available (Tolbert et al. 2008; Caba et al. 2008).

As well as education, another very important variable is the level of Internet access. Recent studies have obtained empirical evidence that greater access to technology raises the likelihood of government websites being consulted by the population (Siau and Long 2009; Gandía and Archidona 2008; Kim 2007; Van Dijk et al. 2008).

Other circumstances, external to local government, may also affect access to the Internet and new technologies. Thus, Serrano et al. (2009) believe there is a strong relationship between the economic status of the population and its access to the Internet and new technologies, i.e. Internet access depends on financial resources. According to Ho (2002) and Styles and Tennyson (2007), in the specific case of information disclosure on the Internet, towns and cities with a lower per capita income are less likely to adopt a sophisticated website design, due to their lower demand for online services. In this regard, various studies have concluded that local administrations where per capita incomes are higher are more likely to develop and apply digital government (Laswad et al. 2005; Rodríguez et al. 2011).

Previous studies have shown that there is a statistically positive influence of political competition on the use of e-government as a means of enhancing information transparency (Cárcaba and García 2008; Gandía and Archidona 2008; Tolbert et al. 2008), making it easier for citizens to evaluate the activities of public managers (Laswad et al. 2005; Caba et al. 2008). In this regard, municipalities in which the governing party has no overall majority have an additional incentive to improve their communication strategies by better use of the municipal web pages (Rodríguez et al. 2011; Gandía and Archidona 2008). Hence, greater political competition can create a favourable environment for the introduction of technological reforms (Tolbert et al. 2008).

As mentioned above, politicians are among the key stakeholders in taking decisions related to government reform and innovation and the implementation of e-government initiatives. According to Rodríguez et al. (2011), the ideology of the governing party can significantly affect the development of municipal e-government.

In this regard, Cárcaba and García (2008) found that left-wing parties have a positive influence on the development of e-government in Spain, while Tolbert et al. (2008) obtained similar findings with respect to the influence of the Republican Party in the USA. Ni and Bretschneider (2007) argued that governments with a right-wing ideology tend to implement programmes or activities of an economic nature, involving reforms in the public sector, while other ideologies are more likely to focus on social policies.

8.5.3 Analysis of Results

Table 8.5 presents the main barriers to the implementation, evolution and development of e-government, according to the IT managers who responded to our survey. These results reflect the impact of the current economic crisis in Spain; the respondents believe their financial resources are insufficient and that this shortcoming is serious (average score 7.52), especially in the medium-sized municipalities (average score 7.84). And budget allocations have been reduced, particularly in the larger municipalities (average score 7.50).

The lack of financial resources is again reflected in the difficulties reported in financing e-government projects (average score 6.48); in this case, perceptions in the larger municipalities are somewhat stronger than in the medium-sized ones (average scores 7.42 and 5.89, respectively). However, respondents do not have difficulty in justifying return on investment (average score 4.87), although given the high standard deviations recorded in this respect, they do not all seem to be facing the same circumstances. The high dispersion of scores in this respect is explained mainly by the existence of political competition, according to the data shown in Table 8.5; the greater or lesser perception of financial cutbacks made to e-government programmes depends on whether the local governing party has an absolute majority or whether consensus must be reached with other parties (i.e. there is greater political competition).

This situation of economic crisis and reduced financial resources is accompanied by problems regarding the staff assigned to ICT initiatives. Many IT managers believe their staff are not sufficiently skilled, and these deficiencies are more apparent in large municipalities (average score 6.42). As well as the staff assigned to the ICT department, those employed in operative departments are also believed to lack the necessary skills, especially in medium-sized municipalities (average score 6.84).

According to the respondents, the staff assigned to this type of initiative are not only lacking in skills but also present a strong aversion and resistance to change. This is particularly so among the employees of medium-sized municipalities (average score 7.68 vs. 6.83 in large municipalities). This reluctance to innovate is generally perceived among the IT managers of large municipalities in our survey (SD 2.08). These data reflect a situation of unskilled labour and of a lack of training, in all municipalities, regardless of size, for staff to cope with changes and innovation (average score 6.90). The lack of qualified personnel to carry out administrative

Table 8.5 Obstacles to the implementation of e-government

To what extent do you consider the following factors limit the efficiency of e-government in your municipality?	Large		Medium size		Total	
	Mean	SD	Mean	SD	Mean	SD
Lack of financial resources	7.00	2.52	7.84	2.19	7.52	2.32
Lack of skilled personnel in ICT department	6.42	2.64	4.68	2.89	5.35	2.88
Issues of computing security	4.75	2.26	4.47	2.67	4.58	2.49
Difficulty in justifying return on investment	4.67	3.03	5.00	2.75	4.87	2.81
Lack of skilled personnel in operative department	5.92	2.68	6.84	2.54	6.48	2.59
Resistance to change among staff	6.83	2.08	7.68	2.36	7.35	2.26
Lack of training in ICT among staff	6.83	1.90	6.95	2.32	6.90	2.13
Low level of ICT skills among users	5.58	2.31	6.53	2.46	6.16	2.41
Issues of privacy	3.83	2.08	4.42	2.57	4.19	2.37
Lack of collaboration between municipal departments	6.17	2.44	6.84	2.22	6.58	2.29
Lack of interest or demand among citizens and businesses	5.08	2.68	5.37	2.54	5.26	2.56
Insufficient bandwidth	3.58	2.91	4.37	2.73	4.06	2.78
Lack of support from managers and politicians	6.33	2.96	7.16	2.79	6.84	2.89
Resistance to change among citizens	3.17	1.90	4.11	2.56	3.74	2.34
Lack of support from regional and/or national administration	5.33	2.87	5.68	2.31	5.55	2.50
Budget cutbacks in ICT due to the economic crisis	7.50	1.57	6.26	2.83	6.74	2.46
Difficulty in financing e-government projects	7.42	1.83	5.89	2.92	6.48	2.63

	Financial resources	Skilled personnel	Organisational problems	External stakeholders	Security and privacy
	Coef. (Student's *t*)	Coef. (Student's *t*)	Coef. (Student's *t*)	Coef. (Student's *t*)	Coef. (Student's *t*)
LN population	0.0869 (0.99)	−0.068 (−0.14)	0.140 (0.18)	−0.030 (−0.40)	0.273 (0.31)
Average age of population	0.300* (1.76)	0.191 (1.38)	0.272 (1.28)	0.230 (1.23)	0.397* (2.01)
Level of education	−0.010 (−0.19)	−0.087** (2.25)	−0.009 (−0.12)	−0.008 (−0.13)	0.041 (0.64)
Access to the Internet	−0.091* (−1.96)	−0.068* (−1.87)	−0.034 (−0.61)	0.016 (0.26)	−0.057 (−0.97)
LN income per capita	−0.383 (−0.37)	−0.173 (−0.16)	−0.921 (−0.88)	−1.17 (−1.21)	−2.412** (−2.21)
Political competition	1.979** (2.21)	1.929*** (2.85)	1.923* (2.02)	0.747 (0.67)	0.997 (1.03)
Political ideology	0.507 (0.60)	1.014 (1.52)	0.395 (0.40)	1.082 (1.02)	0.771 (0.72)
Cons	−10.133 (−0.96)	0.881 (.090)	0.316 (0.02)	3.927 (0.27)	3.282 (0.27)
F (7.23)	1.75	2.23	1.94	2.34	3.03
R^2	33.50 %	47.00 %	25.81 %	24.25 %	29.10 %

Source: The authors
Note: ***1 %, **5 % and *10 %

reforms and to implement new technologies is mainly explained by deficiencies in levels of education; thus, municipalities that score worse in this respect encounter greater resistance among their employees. Moreover, the existence of political competition and the need to achieve consensus among political parties on the decisions to be taken do not favour the organisation of retraining courses or the hiring of more qualified personnel for this type of initiative.

In addition to the problem of the lack of qualified personnel, ICT managers believe there are organisational problems, producing a lack of cooperation among operative departments (average score 6.58), regardless of the size of the municipality. This situation is exacerbated by a lack of support from the municipal managers and politicians involved; although expressed by all respondents, opinions in this respect are diverse (SD 2.89). Thus, the managers of medium-sized municipalities perceive this lack of support to a greater extent (average score 7.16). However, not all respondents believe there is a lack of support from national and regional authorities for the implementation of e-government initiatives (average score 5.55), and perceptions differ considerably (SD 2.50). These organisational problems seem to be internal questions that are influenced by the existence of political competition—as discussed above, the existence of coalitions between political parties hampers the evolution and development of e-government initiatives.

On the other hand, the external stakeholders—individuals and businesses—present a relatively favourable attitude towards e-government initiatives. The IT managers surveyed were aware of no particular resistance to change among citizens (average score 3.14), regardless of municipal size; the similarity of these views was reflected in the low standard deviation among the large municipalities (1.90). It was remarked that citizens and businesses are interested in e-government and make use of the services offered (average score 5.26), although opinions in this respect are very diverse (SD 2.56). In this case, the variables examined did not appear to be significantly influential.

With respect to computer security, privacy and bandwidth, the average scores reported were less than 5.0, although opinions differed. This diversity is significantly influenced by per capita income and average age of the population, i.e. municipalities with a lower average age and a higher per capita income perceive fewer problems of security and privacy. The IT managers did not report any problems related to computer privacy, and their general consensus is reflected in the low standard deviation (2.08) among the large municipalities. The problem of insufficient bandwidth is perceived more strongly among the medium-sized municipalities (average score 4.37 vs. 3.58).

Table 8.6 shows the aspects that are influenced by the implementation of e-government. The survey reveals that e-government in general is believed to improve aspects of organisation and management and to increase the efficiency of business-related procedures (average score 6.84). However, this perception is higher among IT managers in large municipalities (average score 7.25), where there is generalised consensus in this respect (SD 1.86). Although the managers in medium-sized municipalities consider that the implementation of e-government improves procedures, their opinions are more diverse (SD 2.34).

Table 8.6 Aspects influenced by the development of e-government

To what extent do you consider the development of e-government has facilitated changes in the following aspects?	Large		Medium size		Total	
	Mean	SD	Mean	SD	Mean	SD
Improved customer attention	8.58	1.24	7.37	1.98	7.84	1.81
Improved communication and interaction with citizens	8.25	1.42	7.37	2.01	7.71	1.83
Increased efficiency in business procedures	7.25	1.86	6.58	2.34	6.84	2.16
Greater contact between citizens and politicians	4.85	3.14	5.32	2.60	5.10	2.79
Reorganisation of functions assigned to staff in operative departments	6.08	2.97	5.95	2.60	6.00	2.39
Reduction in processing time	8.08	1.31	6.26	2.18	6.97	2.07
Reduction in administrative costs	7.25	1.71	5.89	2.49	6.42	2.29
Reduction in staff numbers in operative departments	2.92	2.07	3.79	2.64	3.45	2.43
Increase in staff numbers in the ICT department	2.33	1.97	3.11	2.56	2.81	2.34
Greater participation by staff in decision-taking	3.92	2.23	3.47	1.98	3.65	2.06
Reduction in manual processes	6.17	1.80	5.68	2.47	5.87	2.22
Higher degree of collaboration and information exchange among departments	6.00	2.13	5.32	2.54	5.58	2.38
Increased productivity	6.33	2.10	4.95	2.50	5.48	2.42
Encouragement for teamwork among personnel	5.83	2.37	2.32	1.70	3.68	2.61
Increased municipal procurement via the Internet	3.17	1.95	2.68	1.95	2.87	1.93
Increased quality and reduced costs in the procurement of municipal goods and services	2.83	1.99	3.58	2.59	3.29	2.37
Greater control of the provision of outsourced services	3.17	2.25	5.00	2.65	4.29	2.62

	Organisation and management	Collaboration and teamwork	e-Procurement	Customer attention	e-Participation
	Coef. (Student's *t*)	Coef. (Student's *t*)	Coef. (Student's *t*)	Coef. (Student's *t*)	Coef. (Student's *t*)
LN population	1.125 (1.20)	1.953** (2.46)	−0.282 (−0.56)	1.271 (1.14)	1.047 (1.127)
Average age of population	−0.249* (−1.72)	−0.011 (−0.05)	−0.075 (−0.41)	−0.294 (−1.52)	−0.049 (−0.21)
Level of education	−0.054 (−0.93)	−0.094 (−1.69)	0.059 (1.30)	−0.069 (−1.10)	−0.101 (−1.30)
Access to the Internet	0.111** (2.58)	0.026 (0.49)	0.092 (1.58)	0.079* (1.87)	0.016 (0.29)
LN income per capita	2.355** (2.66)	0.173 (0.19)	−1.256 (−1.45)	0.792 (0.83)	−0.559 (−0.45)
Political competition	−0.786 (−1.10)	−0.637 (−0.68)	−0.33 (−0.42)	−0.982 (0.99)	−0.999 (−0.92)
Political ideology	1.482* (1.77)	1.964** (3.09)	1.732** (2.49)	0.908 (−0.16)	1.438 (1.63)
Cons	−15.574* (−2.03)	−17.21 (−1.34)	14.881 (1.70)	−1.66 (−0.16)	−0,838 (−0.06)
F (7.23)	3.70	2.26	6.29	1.72	0.95
R^2	45.06 %	31.32 %	49.58 %	30.88 %	16.97 %

Source: The authors
Note: ***1 %, **5 % and *10 %

The IT managers of large municipalities believe that e-government significantly reduces processing time (average score 8.08) and administrative costs (average score 7.25). However, this positive influence of e-government is not perceived so clearly among medium-sized municipalities; moreover, the high standard deviations in this case show that the question of management and organisation is perceived differently by these managers. Similarly, in the larger municipalities, the implementation of e-government is believed to reduce the need for manual procedures, thus increasing productivity (average scores 6.17 and 6.33, respectively), while in medium-sized municipalities, although fewer manual processes are required, their implementation does not increase productivity (average scores 5.68 and 4.98, respectively).

Table 8.6 shows that municipalities with greater access to the Internet and per capita income are more likely to perceive the implementation of e-government initiatives as beneficial to management and organisation. Another relevant factor is the ideology of the governing party in the municipality; those with left-wing administrations are more favourable to the view that the implementation of new technologies and of administrative reforms has a positive effect on governance.

The respondents believe that the implementation of ICT improves the organisation of the functions assigned to the staff of their operative departments (average score 6.00). In large municipalities, e-government is considered to facilitate collaboration between departments and to promote the exchange of information (average score 6.00), but this view is not shared by those who manage medium-sized municipalities (SD 2.50); neither do they believe it to favour teamwork (average score 2.32 and SD 1.70). These differences in opinions regarding the influence of e-government on staff organisation and cooperation are assumed to be due to the size of the municipality, with the larger ones obtaining the greatest benefits. As in the previous case, municipalities governed by left-wing parties are more likely to consider e-government beneficial in terms of its effects on their employees.

Nevertheless, despite the acknowledged benefits of e-government, the IT managers surveyed do not believe it will reduce the number of staff in operative departments or increase their numbers in the ICT department. This opinion is shared equally among managers in large- and medium-sized municipalities, with small standard deviations (2.07 and 1.97, respectively). In addition, the respondents do not consider that the introduction of e-government will produce an increase in online municipal purchases or improve the quality or reduce the cost of the procurement of municipal goods and services. The comments made in this regard were very similar, with little variation in the scores and with low levels of standard deviation.

Table 8.6 also shows that the local governments with left-wing governing parties are more strongly motivated to undertake e-government initiatives.

All of the respondents believe customer service has improved, as have communication and interaction with stakeholders (average scores 7.84 and 7.71, respectively), this opinion being held quite generally, with low levels of standard deviation (1.81 and 1.83, respectively). Public attention and interaction with citizens are significantly influenced by the degree of Internet access, i.e. the municipalities with a higher level of access to the Internet are more likely to facilitate online interaction with citizens and to improve attention in this respect.

While external communication is improved with the implementation of e-government initiatives, this is not the case with internal communication, whether between managers and politicians (average score 5.10) or with employees, by encouraging their greater participation in decision-taking (average score 3.65). Differences of opinions in this respect are not significantly influenced by the variables considered in the study, and given the low r^2 value, further research is needed to consider more variables to explain this dispersion.

8.6 Discussion and Conclusions

e-Government has led to the modernisation of public administrations and has strengthened democracy in governance (Calista and Melistki 2007), providing greater accessibility and information transparency (Caba et al. 2008), improved provision of public services (West 2004) and greater interaction and citizen participation in public management (Dunleavy et al. 2006). These findings have been reported in many academic studies, but do ICT managers and public officials have the same perception?

This chapter examines that question, describing a survey addressed to the IT managers of Andalusian municipalities with over 20,000 inhabitants. These managers' views can provide policymakers with a good perspective of the barriers and obstacles that IT managers must overcome in order to develop e-government initiatives in Andalusia.

Local governments have made great progress in the implementation of e-government, using ICTs to provide more transparency, with new online services, and making government more responsive to the needs of citizens (Ruano 2013). Managers in local governments in Andalusia with more than 20,000 inhabitants are aware of the many advantages offered by e-government, especially the administrative flexibility achieved. However, many obstacles remain concerning the adoption, evolution and development of e-government initiatives in these municipalities.

One of the main obstacles to be faced is the lack of financial resources. The cutbacks imposed as a result of the economic crisis have had a major impact on e-government initiatives, which have been severely affected by reductions in ICT budget allocations. The IT managers of large municipalities are more strongly aware of these budget cutbacks, and report increased difficulties in financing their e-government projects, although the approach taken to these problems also depends on ideologies and the degree of political competition in the municipality.

As well as the lack of financial resources, the respondents highlight the fact that their IT and operational staff lack the necessary skills to undertake and participate in e-government initiatives and, moreover, present resistance to change, especially in the smaller municipalities. This problem, of personnel who are both lacking in skills and unwilling to accept change, occurs more frequently in municipalities where education levels are lower, since the use of technological applications and the adaptation to a virtual working environment require specific technical knowledge

and skills (Kim 2007). For this reason, municipalities where a larger proportion of the population are university educated will have more workers who are willing and able to adapt to new working environments.

Previous studies have shown that better education and training could make workers more aware of the many advantages of e-government (Ebbers and Van Dijk 2007). However, our survey highlights the absence of staff retraining and recycling courses and reveals that the presence of political competition, leading to consensus decision-making among political coalitions, does not favour the organisation of this type of retraining. Thus, staff resistance to change appears, at least in part, to be due to a lack of support in this respect from policymakers, who show little interest in or support for these initiatives. Hence, there is an absence of leadership in this regard.

As a result of the skills gap, according to our respondents, the implementation of e-government has not led to any reduction in staff numbers in the operative departments nor to any increase in those in the IT department, despite the findings of previous research that the implementation of e-government is associated with a reduction in staff levels (Moon and Norris 2005).

As well as staff shortages, there are organisational problems. According to our respondents, e-government does not encourage collaboration between departments. It is believed that a lack of specific qualities and skills among IT staff, together with their ignorance of the potential of e-government, contributes to the municipality's shortcomings and weaknesses in this area. Moreover, the data obtained in this study reflect a complete lack of support from national and regional administrations. These internal problems are compounded when there is political competition within the municipal government; the lack of understanding among political parties is a major obstacle to e-government initiatives among Andalusian municipalities, a finding that contradicts earlier reports (Rodríguez et al. 2011; Gandía and Archidona 2008; Tolbert et al. 2008).

On the other hand, e-government initiatives are not affected by problems of data security, privacy or bandwidth. Furthermore, and in accordance with previous research findings (Van Dijk et al. 2008; Dimitrova and Chen 2006; Laswad et al. 2005; Rodríguez et al. 2011), municipalities with higher proportions of young people and of citizens with high purchasing power are less reluctant to implement e-government applications and encounter fewer problems in this respect.

The most positive aspects identified by the respondents are that the implementation of e-government increases the efficiency of business-associated processes, reducing both processing time and administrative costs. Therefore, and corroborating previous research (Moon 2002; Moon and Norris 2005), we find that local administrations have experienced organisational change and are aware of the operational benefits arising from the adoption of e-government. The IT managers of large municipalities are more aware that e-government can significantly reduce processing time, administrative costs and the number of manual processes required. However, in the medium-sized municipalities, e-government initiatives have yet to result in increased productivity.

The differing perceptions between different types of municipality are to a large extent dependent on the levels of Internet access and of per capita income; thus,

municipalities that are more favoured in these respects tend to view e-government as having a positive effect on governance. Furthermore, municipalities governed by left-wing parties take a more proactive position to the development of e-government, a finding that corroborates the results of the previous research (Cárcaba and García 2008).

In addition to the above benefits, there have been organisational advances concerning the functions assigned to staff in operative departments, facilitating interdepartmental collaboration and information sharing. These benefits are perceived more strongly by the larger municipalities and by those with left-wing governing parties, and so these characteristics tend to promote the implementation of e-government. However, in general, these IT managers do not believe that the introduction of e-government has produced any increase in online municipal purchases, nor has it reduced costs in the procurement of municipal goods and services.

Municipalities with a higher level of Internet access provide greater public attention. However, and contrary to the evidence reported in previous studies (Feeney and Welch 2012; Xu 2012), e-government does not seem to improve communication and interaction with employees in decision-taking, or communication between citizens and politicians, which would foster greater participation in public affairs.

In summary, we agree with the findings of previous studies (Norris and Reddick 2013; Belanger and Hiller 2006) that the lack of financial resources for ICT investment, the absence of skilled personnel and the insufficient support received from policymakers are the main barriers to the adoption of e-government. This adoption involves organisational changes, which subsequently reduce both processing times and administrative costs. However, this change does not result in greater participation by employees and citizens in public affairs or in decision-taking.

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Chapter 9
The Use of Social Media in the Public Sector: Some Lessons from the Netherlands

Dennis de Kool

Abstract Under the label of E-government, governments are undertaking different activities that are directly related to the development of the modern information society. In this chapter, we will focus on a specific communicative challenge of E-government, namely, the use of social media tools by civil servants. Social media are rapidly penetrating the modern information society. This new generation of digital applications emphasizes the importance of user-participation, content-sharing, and accessible communication. Both companies and governmental agencies are exploring carefully the possibilities of social media to communicate with customers or citizens. An important reason is the assumption that the use of social media can result in governments that operate more effectively and efficiently. However, for civil servants the utilization of social media brings both challenges and risks. This chapter analyzes the challenges, risks, and dilemmas of social media for Dutch civil servants. The theoretical framework that is used consists of a "classical" and a "modern" approach to civil servants. In the classical "Weberian" model, politicians are responsible for policy making (and communication about it) and civil servants have to implement policies ("the primacy of politics"). This "principal" approach implies a limited role of civil servants in the virtual world of social media. On the other hand, the "modern" approach to civil servants highlights the professional expertise and distinctive responsibilities of civil servants. The "pragmatic" approach leaves more space for active participation of civil servants on the Internet. For this reason, a fundamental reflection about the primacy of politics, the role of governmental communication, and the culture in the new social media landscape is necessary.

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9.1 Introduction

Under the label of E-government, governments are undertaking different activities that are directly related to the development of the modern information society. E-Government can be described as "the use of modern information and communication technologies, especially Internet and web technology, by a public organization to support or redefine the existing and/or future (information, communication and transaction) relations with stakeholders in the internal and external environment in order to create added value" (Bekkers and Homburg 2005, p. 6). In this chapter, we will focus on a specific communicative challenge of E-government, namely, the use of social media tools by civil servants.

Social media are rapidly penetrating the modern information society. This new generation of applications emphasizes the importance of user-participation, content-sharing, and accessible communication (e.g., O'Reilly 2007; Smith 2009). Both companies and governmental agencies are exploring carefully the possibilities of social media to communicate with customers or citizens. An important reason is the assumption that the use of social media can result in governments that operate more effectively and efficiently.

However, the use of social media by civil servants provides not only for opportunities but also for risks. Recently a Dutch chief police officer was reproached because of a negative tweet about a political party and a commander from a Dutch fire brigade got fired because of sexual content on his personal Hyves[1] page. Civil servants, in contrast to citizens, have to deal with tensions and dilemmas inherent to their public duties. This brings us to the next research questions: (1) What are the opportunities and risks of the use of social media by civil servants? (2) How does the (informal) use of social media by civil servants relate to the existing (formal) procedures, rules, and regulations?

This chapter will elaborate on the opportunities and risks of government interactions with citizens by using social media, while we take into consideration the institutional, formal, and public context in which civil servants operate.

Our empirical insights have been gathered by semi-structured interviews with over 20 civil servants and communication advisers in different departments and different levels of government. The respondents, using social media in different degrees, have been contacted through the virtual platform Civil Servant 2.0 ("Ambtenaar 2.0" in Dutch) in their role as being field experts.

First, we place the emergence of social media in the broader context of E-government and discuss the strengths and weaknesses of social media for public organizations based on insights from the literature. Second, we develop a theoretical framework in which we distinguish two approaches to civil service acting, namely, a "classical" and a "modern" approach. Then we analyze our empirical findings by describing the perceived strengths and weaknesses of social media for Dutch civil servants. Finally we draw conclusions from our empirical results and present some reflections.

[1] Hyves can be seen as a Dutch variant of Facebook.

9.2 The Concept of Social Media

Social media is a label for many new Internet technologies that are used to share information, for example, pictures, movies, music, and expertise, with other people (de Kool 2010). Examples of social media tools are LinkedIn, Twitter, Yammer, and blogs. The emergence of social media poses several challenges for public organizations. On the basis of literature, different strengths and weaknesses of social media can be named.

9.2.1 Strengths of Social Media

First, social media can account for easy accessible communication with the outside world (de Kool and van Wamelen 2008). This "digital dialogue" can reduce the gap between the government and society and can account for an increase in effectiveness of government policies. Additionally social media can facilitate and stimulate participation and self-organization (Boulos and Wheelert 2007). As a result of this citizen involvement in policy can increase and so creating new forms of democratic governance (Reddick and Aikins 2012). The participatory or direct forms of online citizen involvement in addressing public challenges are called "e-democracy" (Chadwick 2009, p. 12). Social media can also attribute to the organization of collective intelligence and improving policies by activating the "wisdom of the crowds" (Surowiecki 2004). From this perspective, we can observe a shift from users and consumers to coproducers and creators (Pascu et al. 2007; Wyld 2007, p. 12). Due to the online feedback from citizens, policies can potentially be enriched. However, an important condition for these online (policy) communities to be effective is cognitive diversity to prevent "groupthinking" (Surowiecki 2004, p. 36). Furthermore governments can use social media to monitor relevant developments sooner ("social media monitoring") and react quicker ("webcare") to virtual needs and dissatisfactions in society (Bekkers et al. 2011). This might lead to increased transparency. Also, because of social media, civil servants can become able to work more efficiently, share knowledge in an accessible way, and potentially improve public service delivery, because social media provide insights in the behavior, expectations, and critical online statements by citizens (de Kool 2010). Finally, digital networks can be developed which facilitate and optimize collaboration between citizens and officials from public organizations (Anthopoulos et al. 2007; Linders 2012).

9.2.2 Weaknesses of Social Media

A weakness of social media is that digital content (almost) always remains present online and that politicians and civil servants thus can be confronted with their digital footprints for many years (Ministerie van Algemene Zaken 2009).

Furthermore, social media can distribute and enlarge news very quickly. In practice, this often leads to lots of attention for current incidents and misconceptions of the day. The speed of the medium can also collide with the meticulous and therefore "delaying" procedures, regulations, and rules which have to be taken into account in government communication activities. The reliability and quality of information used in virtual discussions can also be a doubtful factor (Beer and Burrows 2007). In practice the level of online discussions is mostly varying and noncommittal. Carr (2005) refers to this as the "hegemony of the amateur." This observation can, either correct or not, lead to the trivialization of social media. Another risk is that it is often unclear whether in social media the participants are representative for a larger group. This could lead to a situation in which the voice of an empowered citizen with digital skills is heard better than the voice of those people who are not participating in the digital debate (Frissen et al. 2008). Private companies can also employ professional lobbyists to steer or distort digital discussions. Another point is that we have to realize that the privacy of users online could be violated or abused (Eggers 2007; Beer and Burrows 2007). Furthermore, public disobedience toward existing or potential policy can be very quickly organized while using social media. Bekkers et al. (2011, p. 28) here speaks of "micro-mobilization," which can undermine government authority. An example is the London Riots in 2011, in which social media played an important role in sharing information and mobilizing citizens (Glascow and Fink 2013). A Dutch example is the riots after a Project X "party" in the village Haren, in which a personal invitation for a birthday party on Facebook played an important role. The impact of these riots was so large that an official commission was set up to evaluate these riots (Commissie 'Project X' Haren 2013). Another risk while using social media is that it can result in an overload of information which can account for a "paradox of choices" so one cannot see the woods for the trees (Schwartz 2004). The complex challenge of dealing with large amounts of (unstructured) data from different sources is also called "big data" (Manyika 2011; Yiu 2012). Finally, in some communities civil servants are not yet an accepted group of users on the Internet. Civil servants mingling in online discussions could result in a "big brother is watching you" feeling among other Internet users. For this reason, the "surveillance society" (Lyon 2001) is facing some normative objections.

9.3 Two Approaches to Civil Service Acting

The potential opportunities and risks of the use of social media for public organizations cannot be viewed outside of the civil-political context in which civil servants operate. Because of this unique and regulated context, civil servants cannot move online as freely as citizens can. In order to understand this context, a frame of reference has been developed in which a distinction is made between a "classic" and a "modern" approach to the communicative actions of civil servants.

In the classic approach, the "Weberian" dichotomy between politics and public administration clings to the normative distinction between the democratic legitimized politician and the undemocratic legitimized civil servant. In a representative democracy, the "primacy of politics" is the norm which is closely connected to the idea of civil servants' loyalty (Bovens et al. 2001). It is expected from civil servants to be loyal toward their political superiors and account for a "serving" role.

In today's practice, the distinction between politics and public administration is not so unambiguous as it seems (Bovens et al. 2001). It is complemented with a "modern" pluralistic approach, which offers room for the expertise and professionalism of civil servants ('t Hart et al. 2002).

The intertwining of both approaches has resulted in several conflicts between former politicians and civil servants in the Netherlands. Examples were incidents between the Minister of Justice (Sorgdrager) and the Public Prosecution Service (Docters van Leeuwen), the Minister of Defense (Ter Beek) and a General of the Armed Forces (Couzy), and the Minister of Economic Affairs (Jorritsma) and Van Wijnbergen, former Secretary-General of the Department of Economic Affairs (Hupe 2007).

The rise of social media makes it easier and attractive for civil servants to make (political) statements on the Internet. In reaction to this several new initiatives and programs have been launched to offer civil servants some grip in executing their (communicative) tasks. Among these are the documents on alternative working practices or "Het Nieuwe Werken" (Ministerie van Binnenlandse en Koninkrijksrelaties 2009a), the guideline "Handreiking Modelgedragscode Integriteit" (Ministerie van Binnenlandse en Koninkrijksrelaties 2009b), the guidelines about online communication by civil servants (Voorlichtingsraad 2010), and other initiatives launched to facilitate civil servants with practical guidelines when deploying social media.[2]

9.4 Empirical Findings

9.4.1 Research Strategy

We used different research techniques to collect our empirical data, namely, a combination of desk research and semi-structured interviews. We interviewed 20 respondents, namely, ten (senior) policy makers from both national and local governments and ten (senior) communication advisors. We interviewed not only respondents who are actively using social media ("believers") but also government

[2] Dutch examples are the "Handreiking Ambtenaar 2.0" by the platform Ambtenaar 2.0, the "richtlijnen sociale media" by the province of Overijssel (Provincie Overijssel 2010), and the "richtlijnen gebruik sociale media" by the municipality of Heemstede (Gemeente Heemstede 2010).

officials who are reluctant to use social media to find out their reasons and objections too. Our respondents have mainly been contacted through the virtual platform Civil Servant 2.0 ("Ambtenaar 2.0" in Dutch) in their role as being field experts. In the semi-structured interviews, we focused on the next topics:

- Asking the respondents to discuss and explain their perceptions about social media
- Naming the concrete social media applications that the respondents are using
- Naming and explaining both the experienced and expected advantages and risks of social media
- Discussing the (perceived) dilemmas between formal communication rules and government regulations and informal online activities with social media

9.4.2 Opportunities of Social Media in Practice

In practice, civil servants use social media in a varying degree. LinkedIn, Twitter, Yammer, and blogs are mostly mentioned. The respondents identified several opportunities of social media, which we will discuss below.

9.4.2.1 Social Media Keep Civil Servants Alert

Social media "force" civil servants to stay alert on their societal responsibilities. Social media have a much larger reach and impact than, for example, statements in a neighborhood pub. "With social media civil servants continuously have to weigh out what they are able to say" (interview). Aberrations can be punished remorselessly.

9.4.2.2 Efficiency: Getting Information in a Short Time

The respondents claim that their work can be done quicker, cheaper, and more efficient because of social media. By using social media, civil servants can accumulate a lot of knowledge in a short time, internally as well as externally. "Thanks to social media civil servants now can contact each other quickly. Social media account for a low threshold to contact colleagues and experts" (interview). As a result, public tasks will possibly be accomplished more efficiently.

9.4.2.3 Effectiveness: Increase of Support and Legitimacy

Citizens can be (inter)actively involved in processes of policy making by using social media. "The more people involved in policy and implementation processes, the higher the legitimacy of government organisation's actions can become" (interview). This can have positive effects on citizens' support for policy choices.

9.4.2.4 Mobilization of Knowledge

As a result of the interactive character of social media, the "wisdom of the crowds" can be activated. "Thanks to social media civil servants become able to reach (field) experts operating outside of the established channels simpler and quicker. By allowing these people to cooperate actively, more ideas can be gathered" (interview). An example of this is the online platform Community of Talents that aims to generate creative ideas on innovation by society.

9.4.2.5 Early Detection of Matters at Hand

The low-threshold character of social media enables civil servants to be aware of matters at hand and/or to organize dialogue with target groups of policy. "As a result civil servants are better informed about citizens' ambitions, wishes and expectations" (interview). That offers new possibilities for customization and responsive services.

9.4.2.6 Larger Reach

Because of social media, civil servants become able to reach more people with less effort. "As communication tool social media have a larger reach than traditional media. Launching a classical radio commercial cost more energy and money" (interview).

9.4.2.7 Flexibility

Social media are not bound to specific times. "An advantage for the organization as employer is that civil servants can have an active attitude towards subjects of their professional interest outside of working hours and their involvement with these subjects will increase" (interview).

9.4.2.8 Personalization of Service Delivery

More custom-made services can be accomplished with the help of social media. "Social media facilitate civil servants to communicate with their environment in a more personal manner" (interview). An advantage is that distant governmental agencies get a personal "face."

9.4.3 Risks of Social Media in Practice

On the other hand, the respondents also identified several risks posed by social media. In this section, we will discuss these risks in more detail.

9.4.3.1 Doubtful Image

Sometimes social media hold the image of (anonymous) insults, asocial behavior, harshness, and superficial discussions. Because of this the significance of social media is sometimes trivialized by government organizations. However, respondents show a nuanced opinion on this. They emphasize that amateurs as well as experts can make fruitful, virtual contributions. Additionally they state that "harshness" does not only occur in the virtual world but also in the offline domain, for example, during sharp debates in parliament.

9.4.3.2 Volatility: Focus on Incidents and Misconceptions of the Day

Social media can easily lead to an increasing attention for incidents, which is the result of the enormous speed in which news can be distributed and enlarged. "This does not indicate that there are more incidents, but that incidents have become more visible than before" (interview). It poses a risk that civil servants and politicians move their attention towards incidents and "misconceptions of the day."

9.4.3.3 Discussions on "Own Files" are Sensitive

Civil servants need to keep the formal policies of ministers and existing agreements and sensitivities into account. "Civil servants are not stimulated (or allowed) to open discussions on subjects within their caseload and files, while that is their field of expertise" (interview). They are expected to defend the policy of their minister.

9.4.3.4 Representativity

Citizens vary in the degree they are active in the digital domain. This could lead to a distortion in virtual discussions. "A risk is that people are heard who are not representative for the target group of policy" (interview).

9.4.3.5 Breach of Privacy

A risk posed by the open character of social media is that personal information is inadequately protected (privacy). This is a risk not only for citizens but also for civil servants. "Especially for civil servants with enforcing duties, such as police officers and inspectors, a public profile can be a threat to the performance of their professional duties" (interview).

9.4.3.6 Protection of Information

The emphasis in social media is on the sharing of information with others ("openness"). For civil servants, sharing information with the outside world can be problematic since governmental information can be sensitive or confidential or can damage their organization's reputation. "To prevent this information to fall into the wrong hands, it needs to be secured properly" (interview). However, protecting information in an open environment is a difficult matter.

9.4.3.7 Loss of Concentration

Working with social media can be a labor-intensive task. "Social media tend to disrupt regular work processes. It is, like e-mail, an extra channel of communication. Before you know it civil servants are constantly reading digital messages which will lead to loss of concentration" (interview). Additionally the use of social media in formal meetings, for example, twittering during consultation meetings or public debates, can cause irritation with other colleagues.

9.4.3.8 Risk of Criticism Due to Visibility

The risk of criticism through social media for civil servants is real. Civil servants can be subject of unpleasant discussions or "verbally attacks" in the virtual world. "Social media can have a large impact. Aberrations can be enlarged which is unpleasant for civil servants (…) The visibility of civil servants increases while before they operated relatively invisible behind their minister or head of department" (interview).

9.4.3.9 Human Error

In social media, civil servants should be alert. "Everybody, including journalists, can find the information and messages that civil servants post online" (interview). Civil servants constantly need to weigh what they post online. The respondents state that it is almost inevitable that situations will occur in which civil servants make statements they will regret later. "Social media are tools for human beings, therefore mistakes are unpreventable. It is however important that professionals are able to address each other about their statements" (interview). The use of social media remains subject to human error, but the same is also true for "formal" communication.

9.4.4 Dilemmas

Next to the observed opportunities and risks of social media, civil servants are confronted with several dilemmas.

9.4.4.1 Principal or Pragmatic Approach to the Primacy of Politics?

In the "classical" approach, politicians decide on the political boundaries and civil servants loyally execute the policies. It could be said that in this "principal" approach to the primacy of policy, the use of social media by civil servants limits itself to the broadcasting of information on the political direction as stated by the minister. These formal restraints are in line with the "Oekaze Kok" from 1998.[3] On the other hand, in the "modern" approach, there is more room for expertise and professionalism of civil servants. This "pragmatic" approach is used in the advice by the Council for Public Administration (Raad voor het Openbaar Bestuur in Dutch) which states "that the principal attitude towards the primacy of politics should be left behind" (Raad voor het Openbaar Bestuur 2010, p. 19). In this perspective, there is more freedom for civil servants to deploy social media, for example, by giving an expert response in virtual discussions, as argued by the previous Dutch ministers Klink and Cramer (De Volkskrant 2009).

9.4.4.2 Deploying Social Media Passively or Actively?

Many governmental organizations struggle with the question whether they should deploy social media "actively" or "passively." Civil servants can use social media as an instrument to detect relevant signals on the Internet, for example, by following discussions on subjects in their caseload. This strategy is also called "social media monitoring." Social media monitoring is the continuous systematic observation and analysis of social media networks and social communities (Fensel et al. 2012). In this activity, there is no interaction because civil servants exclusively gather information from the Internet without responding to it. Governmental organizations can also deploy social media actively to broadcast information, for example, by responding to statements or complaints which are distributed through new media. This strategy, also called "webcare," is interactive with the outside world. Webcare includes online interactions with customers or citizens (van Noort & Willemsen 2011).

9.4.4.3 Direct or Indirect Communication?

The traditional governmental way to distribute information occurs through press officers and communication advisers. This in principle also goes for online communication. A new challenge is that communication through social media proceeds very quickly. The respondents note that civil servants sometimes make the pragmatic choice to bypass the communication advisers in online communication issues,

[3] The Oekaze Kok refers to the document "Indications external contacts national civil servants" (Aanwijzingen externe contacten rijksambtenaren in Dutch).

because direct communication by themselves is often quicker and simpler. Press officers and communication advisers are not happy with this situation, because they fear losing control over the communication process.

9.4.4.4 Additional Directives?

There was a consensus among the respondents that the principles for online participation and communication are not essentially different than those for offline contacts. Governmental principles therefore are not changing, only the context. Additionally respondents are aware that they are (seen as) civil servants for 24 h a day and 7 days a week. Nevertheless, some respondents feel that it is understandable that specific guidelines for online activities are being imposed. Most respondents prefer general basic and practical principles instead of specific new regulations. Other respondents have no need for such new regulations or "rigid" directives. However, they do acknowledge there always will exist a gray area within which civil servants will always have to weigh their choices. This gray area does not only exist in relation to social media but also to traditional channels of communication. As professionals, they regard themselves well capable of knowing where the borders lay. However, civil servants do feel the need to open discussions with colleagues to learn from each other's experiences.

9.4.4.5 From Practical Guidelines to Smart Strategy?

The use of social media is ideally not an end in itself but a way that can facilitate governments and civil servants to operate more effective and efficient. A striking paradox in this study is that social media can save time but can also become a time-consuming activity. For this reason, we plea for a smart social media strategy that goes further than pragmatic and practical "communication" guidelines that are currently being developed on the national, regional, and local level. The use of social media in one policy case can be more obvious than in other cases. Probably the use of social media in one phase of the policy process has more added value than in the other stages of the policy process. New research may shed further light on it.

9.5 Conclusions and Reflections

The use of social media by civil servants in practice brings both opportunities and risks. The opportunities and risks with which civil servants are confronted in practice match the factors drawn from literature to a large degree. However, some nuances should be made. The deployment of social media can bridge the gap between the government and society but can also enlarge it. This has become visible in the (virtual) debate on the swine flu vaccination in the Netherlands. Additionally it is shown

that social media can keep civil servants alert and increase efficiency in work processes, and at the same time, social media can distort regular and physical work processes. When taking conscious decisions on whether to deploy social media, the context in which an organization operates needs to be taken into account. With sensitive and complex files, the deployment of social media might be a less obvious choice. The added value of social media can be different per policy stage, for example, policy design and implementation. This requires a custom-made strategy.

The respondents in this research value their own expertise and professionalism highly. The primacy of politics poses civil servants the fundamental question whether they should deal with social media in a principal or pragmatic way. Formal bureaucratic boundaries offer civil servants little freedom to communicate with the outside world. In contrast, several previous Dutch ministers have presented themselves as advocates of "expert bureaucratic response" by their civil servants. This ambivalent signal toward civil servants justifies a critical reflection on the present formal bureaucratic boundaries and regulations and the meaning of the "primacy of policy" within the social media landscape. From the perspective of responsive democracy, active online activities by civil servants, for example, are less problematic than within a strict interpretation of representative democracy.

Another relevant matter is related to government communication. This research shows that civil servants sometimes make the pragmatic choice to bypass communication advisers in online communication. Additionally it is virtually impossible to exert central control over the virtual and dynamic communication process when using social media. This brings along new challenges for communication advisers and press officers. For this reason, a reflection on the role, interpretation, and positioning of government communication in the social media landscape is necessary. In order to make reasoned judgments, it is important to systematically measure the (un)intended results of online interventions by public organizations. This is not easy. The literature shows that also companies are also struggling with the impact assessment of social media (Social Embassy 2011).

Finally it is important to note some fundamental differences between social media and governmental practices. This refers to the open character of social media versus the closeness of government organizations, the self-organizing capacities of social media versus the traditional focus by government organizations on control, and the horizontal character of social media versus the hierarchic structuring of government organizations. These fundamental differences require a reconsideration on the governmental culture that is needed to stay "connected" to the networked society.

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Chapter 10
Managing e-Government: Stakeholder View from the Administration Service Developers

Tommi Inkinen and Maria Merisalo

Abstract Collaborative models for arranging electronic online services have become an important supplement to the traditional in-house provision within government. This chapter analyzes stakeholder view on e-government from the public sector management. The chapter applies target group interviews from 15 representatives working on the "electronic services and democracy" (SADe) program. Three main discourses are interpreted. They are efficiency and e-government, e-government as a tool for improving democracy and participation, and potentials for cross-sectional transforming government. There are a number of problems to be solved before the easily accessible single-platform service interfaces are realized. The main questions concern the role of private sector involvement, privacy and data security, and legislation. Additionally, the transformations in the working cultures of governmental organizations provide challenges for automation and management.

10.1 Introduction

The development of efficiency and transparency in government to citizen (G2C) interaction has relied extensively on the development of information and communication technologies (ICTs). Heeks and Bailur (2006) provided an extensive research evaluation on electronic government (e-government) research that has simultaneously expanded from the early technology and engineering-driven analyses towards human agency and customer-based service provision. Stakeholder and service provision arrangement analyses are the clearest examples of these organizational and customer-based aspirations in current research (e.g., Snellen 2002; Andersen and Henriksen 2006; Rodríguez Bolívar et al. 2012). Weerakkody and Reddick (2012)

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identified three main strands within the extensive e-government literature. These include studies focusing on implementation of new solutions and software; studies focusing on citizenry and end users as active participants, e.g., in planning processes and feedback providers (e-participation); and, finally, studies focusing on transformation and change in governance and practices of government. Our chapter falls into the final category in this classification.

Governments are hierarchical collectives including a number of administrative sectors governed by ministries. This may be defined as a sector-based governmental structure. An interchange of registry information between government agencies, concerning individual citizens, is prohibited by the Finnish law in order to secure privacy rights in Finland. This is a general challenge affecting most countries in e-government development. This chapter provides an investigation of an extensive electronic government program "SADe" (electronic services and democracy) from Finland. The theoretical foundations of the chapter include e-government provision logic and reflections on management and e-government theories together with issues of social construction of technology, e-inclusion, accessibility, and computer literacy (Kamal et al. 2009; Jaeger and Bertot 2010). Our chapter addresses three main research questions (RQs):

1. What principal discourses may be identified from the service developers regarding their view on e-government development?
2. What strengths, weaknesses, opportunities, and threats (SWOT) are identifiable in these discourses concerning e-government?
3. How do developers perceive the role of e-government in the development process of democracy?

National governments are often considered to be at the core of e-government as they represent the authority over taxation, police, and military—the fundamental services defining a territorial nation. Municipal jurisdictions and services commonly concern daily activities such as the provision of public health care and elementary and secondary education, maintenance of libraries, and services for the elderly. The spatial structure of public authority requires attention as the national governments are in most cases the drivers of the e-service development—not the regional or local authorities. Consideration of the exercise of public power towards citizenry is needed. Recent efforts and examples involve new participatory systems developed for urban planning as our data indicate (also Gupta and Jana 2003; Evans-Cowley and Conroy 2006). We narrow our approach concerning provision side and public organizations (ministries and other provision stakeholders) responsible for the execution and development of e-government. Citizens and businesses (customers and coproducers of e-government services) are target groups discussed within the interviews.

The chapter is divided into seven sections. Following Sect. 10.1, Sects. 10.2 and 10.3 provide the conceptual background and the context for the SADe program. After contextualizing the case, the chapter presents methods, data, and limitations (Sect. 10.4). The analysis Sect. 10.5 is structured to answer the first research question: subtitles represent the identified discourses extracted from the data.

We apply SWOT framework in order to answer the second and third research questions within the identified discourses. After the analysis of discourses, the chapter moves to the discussion in Sect. 10.6 and then finally to the presentation of the conclusions.

10.2 Understanding Public Sector Management Within e-Government

Our chapter involves two main strands of investigation: how citizen services are considered (Carter and Bélanger 2005; Axelsson et al. 2010) and how government organizations understand e-government as means to improve administrative process (Fountain 2009; Roy 2006). There are several essentials identified in the earlier research conducted on e-government and citizenry, including an understanding of the societal level of ICT use know-how (skills and means to interact with the providers—how to design online services for all); socioeconomic structuring of the society indicating segmentation of interaction (how to improve online activity within population); and resources and tools for increasing citizen participation in decision making and policy formulation. From the providers' perspective research highlights the goals of gaining cost and time efficiency, transparency, and citizen inclusion. Previous research has also indicated that e-government systems highlight an image of modernization rather than supporting actual improvements and enhancements in governance (Margolis and Resnick 2000; West 2004). This critical aspect has importance as our data concerns persons who are responsible for creating state-of-the-art e-government services. Our data examines a stakeholder group that commonly uses top-down perspective towards governance as they, in the end, define and produce the end product. Thus, theoretically and empirically studied e-government may be interpreted as tools for developing e-democracy, referring to the transformation of the public sector activities and conduction of the use of public power supported by electronic networks and services (also Heeks 2005; Christensen and Lægreid 2007).

Governments are spatially organized, the scales being international (e.g., EU), national, regional, and local. Spatial scales interact with each other. The international scale sets the parameters for IT solutions in terms of functionality, interoperability, and reliability (as well as international transferability). National scale is defined by the corresponding law defining the obligations of the public sector in its service provision. Smaller spatial scales (regional and local) reflect the national legislation, culture, and ethos. As stated, there are considerable variations among nations in their relation to regional structuring and to the importance of adoption rates of e-government services through benchmarking (e.g., Reddick 2010; Schellong 2010; Weerakkody and Reddick 2012).

Axelsson et al. (2013) have provided an important reference work for our study. They analyzed the Swedish stakeholder palette in e-government and indicated the complexity of the matter. The conflicts of interest among stakeholders prove an interesting research area as "… an e-service can be used to 'serve' some stakeholders' interests and simultaneously restrict others', both deliberately and more unconsciously"

(Axellson et al. 2013: 21). This is particularly when private sector interests are interlinked into the service production process. Additionally, a citizen view and the creation of legitimate governance require a delicate approach in the management of government services.

10.3 The Context on Ground Level: The SADe Program in Finland

The SADe program is one of the spearhead programs initiated by the Finnish government aiming to support e-government and e-governance on national and municipal scales. The program's initial period was 2009–2012 providing an action plan for "e-services and e-administration" for the Finnish government (Ministry of Finance 2009). Based on that initial three-year period, the Finnish Ministry of Finance continued the program for 2012–2015. The original goal of the SADe program was to produce electronic services for all stakeholders including citizens, firms, and public sector organizations. From the beginning, the program has stressed the importance of the end-user experience. The program called forth a single interface platform for all e-government services. This is considered a means to improve cost efficiency, public sector performance, and service quality (e.g., West 2005: De Bruijn 2007).

The program is the first effort initiated by the national government in Finland aiming comprehensively to bring together various sectors of government implemented through ministries. Thus, the program may be considered an attempt to overcome the obstacles of cross-sectional governmental organization. The goal is simple: the customer (citizen) should be able to perform all governmental activities via one service platform regardless of the sector boundaries within the government. The program is coordinated by the Ministry of Finance, and during the initiation period, it involved several actors from governmental organizations, municipalities, nongovernmental organizations (NGOs), and private companies.

A centralized development model is the main conceptual theme applied in the SADe program. One development organization or group acts in concert with various stakeholders aiming to provide a ready-to-use service for government organizations. The adoption by the government needs to be comprehensive. This agreement with all participating organs regarding the adoption and the appliance of the created service is a necessity for a successful outcome. The centralized model provides extensive savings as it decreases the overlapping development work currently taking place in public administration.

The program is divided into six main projects and two additional projects increasing the total number to eight. Each project is coordinated and managed by one responsible ministry. The program is thus a network structure with a coordination unit. The program has identified the following goals:

- Quick and easy service experience: service is managed correctly and the end user is directed to the right authority.
- Services are easily available regardless of external conditions.

- There are new means to participate and interact with the correct bodies within the government.
- Public sector gains more productivity and creates savings.
- More precise and errorless service process and information exchange.
- Collective producing of the services creates savings through more streamlined administrative processes.

We identified the organizations responsible for each of the program projects. The listed goals may be considered an essential starting point for the initial program target. The goals will be contrasted with the arguments obtained from the interviews. For example, "cost reductions" concerning the public sector gained a large attention. The current public sector economic deficits in the USA and Europe have led to national budget cuts and a decrease in public expenditure. This issue is difficult to discuss with politicians but is evident in the work of public servants.

10.4 Data, Methods, and Limitations

The data was collected from SADe program's participating organizations. Interviews from the program were conducted in order to understand the service provision and managerial perspective of e-government. Our approach, therefore, focuses on the supply side of e-government. Totally 15 representatives were selected for the interviews from SADe views from SADe organizations (Appendix). The interviews took place in November 2012 and December 2012 according to a semi-structured group method with open discussions. However, one of the interviews involved only a single person. The method is a classification and interpretation of discourses together with SWOT analysis. The interviews followed a thematic structure which outlined the three main questions of this chapter. The original interview topics are listed here as follows:

- What are the implications for efficiency in the service provision and the potentials for cost reduction for both the supplier (public administration) and citizens as service users?
- How is customer-driven service provision conducted within the SADe program and how is the multichannel service provision principle enabled?
- How do these goals (efficiency, cost reduction, multichannel service provision, and customer satisfaction) relate to current efforts in the development of end-user interfaces (e.g., Facebook (Fb), Twitter, and public sector platforms) and citizen capabilities to apply these new platforms considering socioeconomic groups within society?
- What are the main elements of the SADe program in SWOT framework?

The presented four main topics present the main topics discussed in the interviews. During the interviews particular themes gained more attention (e.g., cost reductions and efficiency) and some elements received less attention (e.g., socioeconomic structuring of society and digital divide). The most important elements

were incorporated into the upcoming interviews and the interviews were developed further (e.g., Silverman 2006). Therefore, the methodology involves a "snowballing" technique commonly applied in studies based on grounded theory (Charmaz 2006; Glaser 2001).

Our approach has limitations concerning the full spectrum of stakeholder views on electronic government and governance. First, the first discourse gained relatively large weight due to the interview structure that originally was designed to separate economic and transaction efficiency gains. The economic efficiency discourse is, therefore, a platform on which the other discourses are connected to (citizens as a target group and the need for cross-sectional government). Still, we consider that the data is robust and insightful for providing understanding on e-government development tasks currently taking place in Finland. Second, the applied snowballing technique gave more emphasis in the interviews towards economic gains and efficiency. This, however, does not change the fact that economic principles and goals for enhancing government efficiency are strongly pronounced in the current e-government development.

10.5 The SADe Program: Achieving Good Services and Efficient Governance

10.5.1 Discourse 1: Efficiency, Productivity, and Cost Reduction

The first identified discourse extracted from the data is named "efficiency, productivity, and cost reduction" as a general agreement was that an elemental part of e-government is the reduction in the service production costs leading to efficiency gains. The decreasing of marginal cost per customer was evaluated as one of the main priorities as they should go hand in hand with the automation of data management. There is also a clear distinction between municipal and national legislations. The most common public authority services that citizens use are produced by the municipalities, including health and care services for all age groups and elementary and secondary education. On the national level, licenses granted by the state department (e.g., passports and driving licenses) are the most utilized. The future goal for licensing development towards higher efficiency aims to transform the whole licensing process (including both front desk and back office) into electronic environments.

The spatial structuring of the government is evident in the practical implementation of SADe. There are impacts on municipal (local) service provision in which the main goal is to create services in which (in the best scenario) the customer does not necessarily even notice the internal delays (or waiting periods) in the application or permission processing. Municipal borders are considered a potential challenge because there is a chance that neighboring municipalities start to create their own single services when a collective solution to combine municipalities into larger groups is required.

Table 10.1 Strengths, weaknesses, opportunities, and threats of the e-government development within the discourse "efficiency, productivity, and cost reduction"

Strengths	Weaknesses
• Reduces the number of complaints	• System reliability and interoperability among several technology platforms
• Reduces response time from initial customer contact	• Overlapping between development projects that are conducted on different administrative levels
• Improves bulk data management	• In several cases, end user interfaces are too complicated
• Releases civil servant work hours from routine work to high-skilled tasks	
Opportunities	**Threats**
• Service paths	• Decline of the national economy and budget deficit
• Licensing development	• Blind trust on IT potential for diminishing costs
• Impacts of environment through efficient licensing	• Data security
• New potentials for creating 24/7 timeframe for application management	• Outsourcing of the crucial public sector tasks to private sector

The program has adopted the slogan "good service and efficient governance" in order to carry out the goals set out in the government platform. The current main goal of the platform, which also impacts on SADe, is the need to balance the national budget deficit. Thus, the goal to cut costs and create financially more efficient government practices is a top-down design. The impact on citizen interface and the creation of easy-to-use services is the official goal of SADe but financial goals are evident behind its design. The cost reductions and public savings are dependent on the willingness of citizens to conduct their affairs online. This is fundamentally connected to broader educational requirements and ICT learning. A national issue in the SADe program's work will be the distinction between national government and municipal services. Municipalities are also expected to pay for the selected services after the conclusion of the SADe program. The extensive adoption of the services by citizens is required and this adds to the pressure on marketing.

We summarize the main arguments from the efficiency discourse in the SWOT framework of Table 10.1. The presented classification identifies that efficiency and cost reductions are impacting the service providing organizations and the decline of the Finnish national economy is a potential threat. The supply-side perspective on the factual benefits of developing e-government and e-governance was considered to include cutting down the government process time from the initial contact (e.g., submission of an application for a passport) and receiving the final product with a minimum burden to the applicant. This practical approach towards improving governance was highlighted in the voices of the services providers: whether or not these are fundamental indicators for improved governance remains debatable.

A relevant concept for realizing the opportunities for e-government is a full "service path" that is particularly important for small- and medium-sized

enterprises (SMEs). The pathway thinking symbolizes an intelligent service structure in which all required parts, e.g., in the establishment process of a small private company, take place. For example, the licensing process should be fully online and the customer should not need to make a physical face-to-face visit to the offices. The National Board of Patents and Registration of Finland (NBPR) together with the Ministry of Finance, as an overseer of taxation, is the reference organization here. In addition, insurance companies, retirement funds, and other employer representative organizations such as the Confederation for Finnish Industries (EK) are participating in development activities where appropriate. Essential recognition has, from the very beginning of SADe's establishment, been concerned with the need for extensive networking and collaboration that should ensure the adoption and agreement of all relevant parties to apply the final services. There are tens of organizations involved in various sectors within the development projects (also Snellen 2002).

Table 10.1 indicates that SADe projects aim to transfer basic information and particularly elementary (routine) guidance into online environments. Basically, the need concerns "Frequently Asked Questions" (FAQs) and standard queries that are easily automated and it provides several opportunities for e-government efficiency. In addition, the simplification of government forms and the routine handling of forms should be moved towards issues requiring more profound human expertise. The development process therefore also has an effect on the contents of the work of public servants. Automation and bulk data handling should be moved from employees to automated e-processes. e-Government has potentials to automate most routine parts of it. The question also includes elements of quality control and the minimization of online transactions. The changes of this magnitude, transformation from paper form-based government to electronic means, require time, and several failures or false courses are to be expected. However, such changes were seen as necessary and inevitable in public sector management.

Individual projects under SADe umbrella have conducted cost-benefit analyses (e.g., Boardman et al. 2006), and the impact of efficiency through transformation of work from human processed to ICT processes was recognized. This requires a pro-change attitude and mind-set in order to realize the extensive paradigm shift towards e-government (also Irani et al 2008). The current role of cost-benefit calculations is to motivate affiliated organizations to pursue the change that is technologically available.

In terms of business development, a theme managed by the Ministry of Employment and Economy and the Ministry of the Environment, e-government services are considered to experience the most vivid development since the emergence of mobile communication and the internet. The ongoing development of easy-to-use services is considered to reduce the SME's red tape significantly. An environmental example is the energy efficiency certificate online service. The ICT management of the construction certificates reduces the need for travelling to local administrative units, aiding particularly summer house owners. Physical distances are long in Finland, and the service helps both the citizen (consumer) and government (provider) to save time and costs.

10.5.2 Discourse 2: e-Government as a Tool for Improving Democracy and Participation

The SADe program provides not only direct efficiency gains in the financial or temporal sense but also indirect benefits that are realized through societal restructuration achieved through ICTs. These include, e.g., the potential for greener urban planning, growth in the participation rates and enhancement of democratic processes, and growth in the voting rates. Thus, the program has implications for the "inclusion" dimension of e-government enabling more people to be able to interact and contribute on public affairs. Accordingly, this chapter provides answer to our RQ3 "How do developers perceive the role of e-government in the development process of democracy?"

The concept of participation needs attention here: as our data is collected from the provision side of e-government, the term is mainly referred here as improving and increasing number of channels to interact with the government. In practice this means citizen feedback on public services. A more accepted and general conception of participation highlights citizen participation in policy formulation. There are already significant developments done in Finland, and, for example, *Kansalaisaloite.fi* (citizen initiative) service has been introduced. It is a service in which citizens may propose new law initiatives. The initiative will be submitted if it collects 50,000 or more support votes from the public. If more than 50 % of the parliament members agree with the submitted initiative, it will proceed to standard processing and possibly into parliament voting for becoming a law. Internationally, *Kansalaisaloite.fi* may be considered as a state-of-the-art e-government service supporting public participation and democracy. SADe's subprojects such as "Participatory environments" and "Learning tools" aim to provide similar e-government tools and interfaces in order to promote active citizenship and improve governmental transparency.

The main element in improving democracy concerns the transparency of governance, which is tightly connected to the increase of citizen participation in decision making. In the light of the existing e-government literature, the goal is to reach the final phase of e-government development through collaborative interaction via ICT platforms (Evans-Cowley and Conroy 2006). SADe program has produced practical solutions for improving participatory e-government. In the case of employer services and stakeholder participation, the Ministry of Employment and Economy has formed a "customer reference group" that utilizes social media. It involves 30–40 invited entrepreneurs who are summoned through social media to improve and give user feedback concerning the online contents, usability, and overall quality. This feedback group also conducts beta-testing for new services before they are launched. Consequently, business stakeholder group involvement is in place even before the final product comes to the market. In addition to reference group testers (firm representatives as users), also usability experts are used in order to get a variety of viewpoints and arguments concerning the functionality and operability of the product. The customer view has therefore a strong position and recognition in the government business service development throughout the whole process.

Another key effort in participation development has been the establishment of a "citizen panel." It broadens the stakeholder variation as the panel may include individuals as private citizens together with representatives from businesses, research institutions, NGOs, and other potentially important organizations. The idea also involves recognition that innovative solutions are seldom created through administrative processes or work. Thus, the citizen panel aims to bring an innovation aspect realized through workshops and other communication platforms as a joint venture among relevant stakeholders including citizens and NGOs.

The role of NGOs is important for the participation project. This connects the citizen panel, as it is voluntary work, to the fundamental question of creating services with no or very small financial compensations. Thus, the citizen panel may be considered an open developer's arena. This ideology is clearly present in the statement of an interviewee from the participation project: "I honestly cannot imagine that here in our office any actually new innovative service could be developed. It requires a broader group including motivated individuals and professionals." One goal is to promote open access and open availability to data sources. This would benefit participation and the citizen-hearing process. e-Government therefore enables the possibility for developing benefits that have not yet been considered. The recognition of weak signals and future trends for citizen-government relations may emerge and provide new solutions for the future.

Trustworthiness should be supported by participation as the impact on the democratic process is manifested through citizen interaction in public hearings. e-Government services have reorganized the hearing process. Citizen opinions are collected during the whole preparation process and during the establishment of the law initiatives. The number of hearings as well as the number of arguments is considerable. There are variations depending on what government action is under consideration. On average there are approximately 20,000 hearing processes annually in Finland. On the national level, particularly concerning the preparation of new laws and initiatives, the documentation content hearings should be transferable into the network environments. The benefits involve the increase of trust, participation, and transparency of "good governance practice" (also Jaeger and Bertot 2010).

Hearings have a direct impact on the number of complaints regarding government decisions. e-Government is a means to give citizens the experience of having a voice and potential of being heard in the decision making that narrowly concerns themselves, or broadly that they have a possibility to comment on a general issue. However, an evident goal behind the integration of various stakeholders into administrative process is the reduction of complaints (e.g., Gowan et al. 2001). This is the main way to improve participation and democratic transparency and inclusion. The Finnish law provides extensive opportunities for both individual citizens and collectives to make complaints regarding public authority decisions. An important benefit that the SADe program aims to achieve is that complaints should be processed as soon as possible, preferably at the beginning of decision making preparation. Complaints may cause problems and controversy particularly in planning: several important construction projects have been delayed, in worst cases for several years, due to complaint processes.

Table 10.2 Strengths, weaknesses, opportunities, and threats within the discourse "e-government as a tool for improving democracy and participation"

Strengths	Weaknesses
• Existing services are already on a good quality level (internationally). This supports good e-government for citizens	• Possible misuse of online services (junk proposals)
• Citizen initiative for new laws	• Not all citizens are able to use online services (digital divide)
• A number of existing stakeholder meetings and platforms	• The role of citizen initiatives is still unclear and the process seeks its form in decision making
• A strong mind set towards developing participation in policy formulation	
Opportunities	**Threats**
• More transparent administrative process	• Strongest voices may gain too extensive role (e.g., populist issues)
• "Knowledge from the people for governance"	• Misuse of created systems in order to promote narrow interest groups
• Small-scale planning and community development and interaction via online and mobile platforms	• System reliability and functionality in crucial issues such as e-voting

Table 10.1 summarizes results of the SWOT analysis for participatory discourse. The analysis brought up the issue of the general way of thinking about government and governance. The mode of the "mind-set" was seen as highly important, and the change in the governance was considered to be slower than originally anticipated. Learned ways and practices change slowly unless radical changes are introduced. The reliability issues of technological solutions are still considered to be one of the main problems. The reliability rate should be a full 100 % and nothing less when services are targeted for the whole population. Service trustworthiness became a clear and visible determinant that underlines the whole SADe program.

Table 10.2 indicates special opportunities for living neighborhoods and citizen participation in decision making concerning residential areas and communities. The participation of citizens is most highly regarded in those decisions which concern local planning and the development of the infrastructure. The spatial organization of public service provision has been one of the most studied theoretical issues in the current planning literature (Ghose 2005; Warner and Hefetz 2008; Sager 2011). There is a need to increase general knowledge of citizens regarding the planning process and related requirements concerning participation. As an example, an initiated project for the built environment aims to produce a single online portal containing comprehensive resources for citizens to either participate or to gain access to planning information. The portal is under construction, and it will be designed to collect information from various sources and therefore also to improve cross-sectional government (identified third discourse of this study). Social media was also seen as a potential channel that could be integrated to portal functions. This is considered to help to improve citizen participation as they should emerge as soon as

possible in the planning process (also Linders 2012). The complaints in the latter parts of the process may put back the whole activity by years. Therefore, wide acceptance as well as citizen feedback is essential for the planning designs.

10.5.3 Discourse 3: Potentials for Cross-Sectional Transforming Government

The SADe program and its subprojects emphasize strongly cross-sectional governance. Cross-sectional governance is not only horizontal but also vertical as the municipal and national service categories are considered to be a continuum. Thus, the e-government interaction towards citizens and businesses is aimed to function as a single-platform "invisible" service. The end user should only interact with the same portal, and if the decision making organ changes in governmental structure, the end user should not notice any difference in the functionality of the service. Management times and delays should be avoided. The SADe program is the first national program in Finland that incorporates practically all municipal and national governance services under one roof.

The main goals and benefits that are brought forward by the SADe program in terms of cross-sectional government are considered to be both practical and theoretical. Thus, there are goals related to practical functions that citizen-government relation change requires. In addition, theoretical goals concern the citizen-government relation and power structures concerning to what extent the public sector should carry responsibilities for an individual and how much can be expected from an individual to take care of his or her government relations. In practice, only a fragment of citizens have knowledge regarding their rights and the implications. Normally citizens have a small number of contacts with the government. The contacts are on a demand basis, and they usually concern applications for ID (passports, driving licenses) or construction permits and related documents currently required for housing and construction. The following elements emerged in the data combining sector-based government processes with cross-sectional analysis:

- Services are available from one platform.
- Streamlining of the service provision (integration of various sectors under one address).
- "Customer first" approach in all sectors (common mind-set).
- Participatory design in service development (citizen and organizational panels).

Table 10.3 presents the SWOT classification for collaboration potentials. The implementation of business sector models into public administration and governance requires the recognition of the functionalities of the applied business logics. The service developers also apply social media in order to carry out their work. Some services will apply Fb for development (work) purposes. The social media thus functions as a platform for communication for developers, but it also acts as a medium to gather more persons and organizations to participate in the work.

Table 10.3 Strengths, weaknesses, opportunities, and threats within the discourse "potentials for cross-sectional transforming government"

Strengths	Weaknesses
• Extensive number of organizations from all stakeholder groups	• Legislation changes slowly
• Creation of new ways of thinking of governance	• Legal questions of registry sharing
• Sector collaboration has increased within government bodies	• Competition vs. collaboration and potentially conflicting interests for different stakeholder groups
• Interaction with business and citizens has improved	
Opportunities	**Threats**
• All national resources may act in concert	• Illegal and unnecessary combination of data registries
• New public–private partnerships and extension of knowledge bases create better decisions	• Big brother society
• Administrative overlaps may decrease	• Data ownership conflicts • Diminishing transparency and blurring of responsible authority in public decision making

A challenge in this is the requirement (for a citizen) to use Fb in the first place. This will probably lead to a broader segregation among societal groups to those who choose and to those who decline to be customers of Fb. This is an interesting development as a North American private company functions as a platform for public sector service development requiring registration and submission of copyrights: the intellectual property right (IPR) questions will probably become a paramount issue in the near future.

Table 10.3 indicates a consideration of social media in government process as it is generally evaluated as "compulsory tool" in order to improve customer-based service design. The interviewees, however, did not know any actual figures of how and to what extent citizens use social media and more importantly, how they use it. It seems a questionable path to create extensive citizen platforms that would rely heavily on private enterprises such as Fb or Google+ in the provision of government services. Table 10.3 also indicates that the copyrights (data ownership) create problems. Some of the SADe project managers consider that "all customers (citizens) use social media including Fb, Twitter, Google+, or Second Life today". These statements have a similar hype trend that was seen in the ICT bubble of the early 2000s. The reality is, however, quite different suggesting a challenging road for digital services that concern the whole societal spectrum within a society. The full societal scope is, unfortunately, forgotten in these voices as a portion of elderly or less well-off citizens do not have enough material or skill-related resources to use computers or the Internet.

Identified weakness on Table 10.3 concerns legal questions of registry sharing, in which exists a significant challenge for improving transparency and cross-sectional governance. An example is the acquiring and delivery of external professional (expert) statements concerning quality and control of construction and building processes. These statements involve environmental permissions (including environmental assessments) and authorizations with technical permissions. These are mainly collected as printed statements and they should be transformed into electronic submissions. Electronic workspaces in cloud environments are seen as an efficient way of cutting processing times and improving the reliability of the information exchange chain. Issues of data security and protection together with ownership questions are elemental and they are needed to be considered. In the cases in which service provision is outsourced, the responsibility of data security and management was considered to belong to the service provider, depicting the current intertwinement of the public and private sectors.

The service production concept created under SADe is considered to highlight stakeholder importance and societal diversity. The inclusion of citizens into the design, and the development of services through panels, was considered revolutionary. The collaborative stakeholder-based model was also considered to have insights for other projects aiming to enhance public sector services. These may include private sector involvement (e.g., subcontracting or consultancy) as well as customer-based starting points (e.g., panels or online forums). The SADe program itself was considered to be an agent of change in pursuit of transparent governance as it drives to promote extensive stakeholder collaboration.

10.6 Discussion: Towards the Transformation of an Administrative Culture and Work?

There are already several results that indicate the need for more efficient e-government. For example, action plans based on cost-benefit calculations and models have been implemented—as a result there are visible changes in the functionalities of the ministries that are derived from the increased knowledge and know-how about how to develop more citizen-friendly end-user services. Therefore, the development concerns not only user interfaces or system interoperability but also broader issues in the administrative culture and how civic servants approach their work (also Coursey and Norris 2008).

Public sector employee well-being and motivation in their tasks are essential in e-government development. Employees see that there are new ways of governing governance and this provides a good motivation and impetus. Fundamentally, the question is about resistance to change and the embedding of learned practices. Thus, e-government development is far more than just creating new software or interface solutions. It challenges the whole ideology of conducting governance and therefore often proves to be highly problematic in the end. This is one reason why government

organs have also adopted terminologies such as “change management” and operating environment change.

The doctrine for “change” was also evident in the broader thematic of enhancing democracy through e-government. Elements of change are most often related to human behavior in terms of learned practices and routines—broadly the working culture—which were considered the main challenge in e-government development. Technology already exists to a large extent. A seminal point was raised in the interviews stating that “government and governance exists for the people!” This is a good reminder that persons responsible for administrative development should also keep in mind (also Rethemeyer 2007). However, most often, the discursive interpretation of the data contradicts this principle: several arguments extracted from the data proved that even though developers use the rhetoric of customer recognition, easy-to-use interfacing, and citizen priority, they expect at the same time that those particular target groups should change their practices and ways of conducting government interaction. There are thus contradictions in the voices of the SADe managers and in several cases they use the language of top-down designs to describe the process of the expected change.

Interestingly, the SADe program was argued to be a “good start” for e-government development considering that there have been projects since the early 1990s which aim to drive forward the very same issues defined in the SADe agenda. The business development project within the SADe program brought up the need to recognize weak signals. There are therefore two elements for consideration: the change of the existing service delivery form and the creation of originally digital-based services. Face-to-face meetings with clients (citizens) should involve only such questions which automation cannot provide answers for. This is one example of the top-down view of looking at e-governance. Social inequalities and digital divides that exist within highly industrialized countries are absent in the voices raised by the service providers. The managerial perspective sees the development of e-governance mainly as provision of technological platforms on the Internet. The issue of improving societal condition is secondary to the technological paradigm.

The introduction of new technologies into work is still problematic. Employees do not start to use technology platforms unless they feel there are clear benefits, as a number of failed projects show. This may be seen as an issue of the diffusion of innovations (Rogers 2003). The pioneers may start to apply latest applications, but if the clear benefit for everyday work is missing (particularly in public sector administrative work), the innovation won’t be successful on mass scale. Government online development is targeted to masses, and therefore also the public officials should feel comfortable working with the developed ICT solutions. An essential issue is also the recognition of different types of knowledge requirements in work contents. The question of routines and civil servant’s willingness to modify and change their work practices both on the individual and on the organizational levels is the main challenge for SADe. Because SADe is a network, the large number of participating bodies and groups need to adopt the change-driven mind-set in order

to become successful. The question is also about change management and the visionary capabilities of the persons in charge of the whole program and its subprojects. Marketing, communications, and advertising play an important role in the brand building for SADe and thus contributing to general knowledge of the existence and goals of the program.

10.7 Conclusions

The answer to the first research question "What principal discourses may be identified from the service developers regarding their view on e-government development?" involves discourses of (1) efficiency and cost reduction, (2) democracy and participation, and (3) collaboration and cross-sectional governance. The process of government is targeted to produce shorter (temporal gains) and a more reliable administrative process. This is the first and foremost discourse. Eventually this will lead to a decrease in complaints and will thus contribute to the overall quality of the service.

SWOT analyses provided answers for the second research question "What Strengths, Weaknesses, Opportunities, and Threats are identifiable in these discourses concerning e-government?" The study identified the fact that not all public services are transferable on the Internet. Telemedicine, for example, in cases of sudden illness, is one instance where ICT solutions could save lives but cannot fully substitute the physical help. In addition, multichannel platforms for public sector services provide a potential future development. The main question becomes to what extent e-government substitutes physical government and to what extent that substitution provides the potential for automation, resulting in employee cost savings in public administration. In terms of improving democracy and participation, there are several innovative online services supporting citizen participation in policy formulation. In addition, improvement of hearing processes is an important topic on SADe agenda to support participation.

The third research question "How do developers perceive the role of e-government in the development process of democracy?" is the most complex one. The democracy aspect is mainly seen as a "potential" for participation and interaction with the existing government structures. The service developers see the role of e-government in the development process of democracy through new technical potentials provided by the ICT development. Citizen participation was seen as a major contributor to that e-government development. The established citizen panel and the number of business organizations involved in the SADe projects highlight the need to redesign the fundamental principle applied to government service provision according to the bottom-up principle. However, the interviews emphasized the importance of not just looking at governance in a top-down fashion. As mentioned above, the citizen aspect was appreciated as a feedback channel, but the larger societal considerations on education, well-being, and quality of life through better governance and

services were subordinate to the technological development paradigm and the search for efficiency.

The e-government development rhetoric stresses the kind of e-government that is designed for an automated 24/7 ideology: the citizen would be able to access and retrieve essential information concerning them when needed. In order to achieve this, the old governmental structures would require redesigning qua sociopolitical considerations of visible and invisible power structures together with public decision making processes. Implications based on empirical results clearly show the need for the service developers directing the SADe project to include more extensive societal awareness into their development plans and processes. There are contradictions within the SADe development program concerning the means of improving citizen participation.

To conclude, research challenges for e-government in Finland and elsewhere concern the recognition of stakeholder opinions and their implications for service development. Our chapter has provided knowledge regarding the provision and the supply side of e-government. The main value added may have been revealed by the SWOT analysis: the administrative persons recognize diversities underlying their development work, but they tend to be restrained by their respective positions which largely keep their development views within efficiency-driven logic lines. The main future challenges for e-government development are related to open citizen-government relations and data management. The problem of inclusions and the analysis of open governance processes continue to be challenges for future research.

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Appendix: Interviewed persons according to their position and organization

1. Project manager, Ministry of Finance
2. Project manager, Ministry of Finance
3. Specialist technology adviser, Ministry of Finance
4. Industry counselor, Ministry of Employment and the Economy
5. Project manager, Ministry of Employment and the Economy
6. Project manager, Ministry of Employment and the Economy
7. Online editor in chief, Centre for Economic Development, Transport and Environment, Southwest Finland
8. Project manager, Ministry of the Environment
9. Project manager, Finnish Environment Institute
10. Program manager, Ministry of Finance
11. Program coordinator, Ministry of Finance

12. Program coordinator, Ministry of Finance
13. Project manager, National Institute for Health and Welfare
14. Project manager, National Institute for Health and Welfare
15. Project manager, Ministry of Justice

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Chapter 11
Manchester as a Digital Powerhouse: Governing the ICT-Related Developments

Mark Deakin, Fiona Campbell, and Alasdair Reid

Abstract The drive to establish Manchester as a forerunner in the digital economy means the city is now considered the "powerhouse" of the North of England, with salaries for city workers at the highest in the UK outside of London. Despite this, Manchester remains home to some of the most socially and economically deprived communities in the UK: just as those who work in the city earn the highest salaries outside London, those who live in the city earn the lowest salaries of the UK's Core Cities. Responding to the particular challenge widespread deprivation poses for a city experiencing economic growth, the administration has deployed an entrepreneurial model of urban development, characterized by close partnerships with private organizations and local actors. This chapter explores the governance of the ICT-related developments responsible for transforming Manchester into a "digital powerhouse" and challenges the city's recently announced "Next Generation Digital Strategy" poses.

11.1 Introduction

This chapter is drawn from the case study findings of the city governance project funded by the European Commission's (EC's) Institute for Prospective Technological Studies (IPTS) and EUROCITIES.

Along with Barcelona, Berlin, and Tallinn, Manchester is one of the four emergent city governance systems IPTS and EUROCITES have sought to explore as a

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set of ICT-related developments (Misuraca and Esteve 2010; Misuraca et al. 2011). Setting out Manchester's socioeconomic structure, this chapter outlines the governance system within the city and addresses the challenges these ICT-related developments pose for their emerging digitally inclusive regeneration strategy (Carter 2009; Deakin 2007, 2009). Having done this, the chapter captures the views and opinions of those with a stake in such ICT-related developments and who are affected by the emerging system of governance within the City of Manchester. These insights are drawn from a series of semi-structured interviews, designed by IPTS and conducted by Edinburgh Napier University, with the City of Manchester's academic, industrial, and administrative communities. The interviews in question were undertaken between December 2010 and January 2011.

From here the chapter reflects upon how Manchester proposes to draw upon this governance system as a means to establish itself as a "Next Generation Digital City" (Mycio and Carter 2008). After reflecting on the impacts this latest phase of ICT-related developments are having upon the City of Manchester, the chapter goes on to set out the key findings of this investigation.

11.2 The City of Manchester

The City of Manchester covers approximately 117 km^2; the population density is over seven times the average for the region and almost ten times the national average. Migration in and out of the city is significant and the city is committed to increasing the number of residents. The population has been increasing at twice the average rate of growth for England and Wales between 2001 and 2007 and at a slightly slower rate in recent years (Manchester Partnership 2007). The 2008-based subnational population projections show that the population of the city will continue to rise to an estimated 519,000 residents by 2015 and 561,800 by 2025 (Manchester Partnership 2009).

Many of Manchester's residents experience significant social and economic deprivation. In 2007, the city was ranked the fourth most deprived local authority in England (Manchester Partnership 2008). Sixty percent of the city's population (234,000) lives in the 10 % most deprived communities in England. Socioeconomic deprivation is described as "widespread across the city" (Manchester Partnership 2009). In 2004, the year the previous English Index of Deprivation (EID) was published, the estimated number of residents living in the most deprived 1 % was 78,599, almost one in five. There has been an improvement in relative terms since 2004, with 2007 figures detailing one in ten Manchester residents living within the 1 % most deprived, approximately 51,155 people (Talukder and Frost 2007).

In terms of the city's geography, the most deprived areas are to the north and the east of the city, but similar patterns of deprivation can be identified using other datasets, such as out-of-work benefit claimants (Manchester Partnership 2008). It is worth noting that the city center continues to improve in terms of its position within

the EID ranking: on the relative scale from 1 to 32,482,[1] the city center moved 7,911 positions between 2004 and 2007, making it the area showing greatest (relative) improvement within the city.

11.3 Governance System

Manchester is represented by three tiers of government: Manchester City Council ("local"), UK Parliament ("national"), and European Parliament ("Europe"). The Greater Manchester County Council administration was abolished in 1986 so the city council is, effectively, a unitary authority. Since its inception in 1995, Manchester has been a member of the English Core Cities Group which, among other things, serves to promote the social, cultural, and economic status of the city at an international level.

Under the leadership of the mayor, one third of Manchester City Council is elected each year for three consecutive years, followed by a fourth year without any elections. The Labour Party has had political control in Manchester since 1973. To meet the challenges which the city's commitments to social inclusion and economic competitiveness pose for Manchester, the administration has deployed an entrepreneurial model of urban development, characterized by close partnerships with private organizations and local actors. These partnerships promote interagency working arrangements and funding agreements key to their success. Nowhere is this model better exemplified than in the ICT-related developments the City of Manchester has instigated to underpin their urban regeneration strategy and support this program's social, environmental, and economic aspirations. In terms of their strict chronology, these ICT-related developments can be subdivided into three phases. In line with their underlying technologies, these approximate to online and web-based infrastructures and service platforms supported by next-generation broadband developments.

11.3.1 Phase 1: Online Services

In the first phase (1989–1993), Manchester sought to emulate Germany, Holland, and several Scandinavian countries in their use of ICTs as a means to underpin policy developments and support urban regeneration. This resulted in two initiatives: Manchester Host as the first representation of Manchester as a virtual city and Electronic Village Halls (EVHs) (Digital Cities 2010). These initiatives were aimed

[1] The geographical unit of measurement in the English Indices of Deprivation is the Lower Super Output Area (LSOA); a unit spanning from 1,000 to 1,500 households. There are 32,482 LSOAs in England; therefore, relative deprivation is ranked on a scale from 1 (the most deprived) to 32,482 (the least deprived).

at offering the citizens of Manchester free access to a platform of city services. Entrepreneurial in nature and driven by a consortia of IT consultancies and media companies, Manchester Host did not prove successful. In the first instance, the city's infrastructure was seen as being too heavily dependent on short-term finance and not inclusive enough in terms of the communities it served. While the infrastructure was seen to support the citizens of Manchester, as a service platform, Host failed to include the city's business sector.

11.3.2 Phase 2: Web Services

The second phase, from 1994 to 2002, saw the launch of Virtual Manchester, Manchester online, Virtual Town Hall (VTH), MyManchester, MAD for IT, and Manchester Virtual City. These developments did much to be more inclusive and exploit the opportunities the Internet offered to deliver online services. In reviewing the successes of these developments, Fourkas (2002) singles out the infrastructure underlying the VTH initiative and singles this platform out for particular praise, noting that

> … we should acknowledge the advances [this particular initiative makes] on the delivery of community services through an increasing number of relevant websites and interactive services such as online application forms, email communication with officers, online information, advice, services etc. The 'community' thematic category comes second in online presence rate. (pp. 48–49)

Furthermore, the VTH initiative attracted attention for other reasons: it also provided the infrastructure underpinning the development of Eastserve, a social enterprise project. Local community organizations and third-sector businesses collaborated to recycle and distribute 350 PCs across ten free Internet access points within New East Manchester. The Wired Up Communities initiative went on to distribute a further 3,500 computers. These new or recycled PCs were available at a cost of either £200 or £50, respectively: installation, delivery, and 3 months' dial-up connection were included free, along with 3 h of introductory training. The local credit union provided immediate low-cost loans, and a total of nine local ICT Learning Centers were set up together with a low-cost computer repair service.

Since 25 % of local residents did not have a landline telephone, a wireless broadband network was developed to offer affordable broadband access from £6 per month, without any contract or hidden costs. During this phase, network coverage more than doubled and a further 1,700 PC packages were supplied. Support for the disabled and elderly was added into the residents' service bundles, while wireless networks linked homes, schools, and ICT Learning Centers. With over 5,500 PC packages distributed and over 2,000 regular broadband customers by December 2006, Eastserve had developed into the largest wireless network in Europe.

Reflecting upon the first two phases of ICT development in Manchester, Fourkas (2002) suggests that any future governance strategy in the City of Manchester should:

- Promote such developments under the widest possible partnership between local agencies directly associated with Manchester's urban regeneration strategy.
- Establish a special office that will be in charge of Manchester's Virtual City development, with this agency acting as a coordinating body for the various partners.
- Ensure any developments bridge the digital divide in Manchester by: (a) advancing the infrastructure needed to 'close the gap' between the information-rich and -poor (b) promote awareness of the service platforms capable of bridging this gap, and offer citizens the training needed to make use of the platforms; (c) encouraging the participation of citizens and businesses from the widest possible cross-section of the community; (d) drawing on national and European Union programs as a way of funding such developments, and (e) securing their long-term financial viability.
- Form a clear, scheduled development plan in terms of aims, priority areas and corresponding actions. Here, priority should be given to the development of small-scale, thematic or district-based projects, which would be integrated (pp. 51–52).

van den Berg and van Winden (2002) and van der Meer and van Winden (2003) detect a policy shift from the 1990s entrepreneurial approach and toward a model of local government-led actions. While many ICT-related developments in Europe during the 1990s were predominately entrepreneurial, they propose VVH and VTH infrastructures are not platforms for servicing the market but for governing them on behalf of the community. In this phase, there is instead a withering away of the market's hold over such infrastructures and emergence of an electronically enhanced government, with the potential for communities to engage with the city's infrastructures and service platforms they offer. According to van der Meer and van Winden (2003), the emerging policy framework is not a clean break from the entrepreneurial approach, but a way for local administrations to begin taking the lead in managing the relationship between what the market wants from them and the community in turn needs.

For van den Berg and van Winden (2002) and van der Meer and van Winden (2003), there are three components key to the successful management of this relationship; these are: access, infrastructures, and services. In reviewing the success of their developments in Manchester, they draw particular attention to significant achievements this administration made in delivering user-friendly access to city services and the underlying infrastructure. For unlike the top-down entrepreneurial drive of the first phase, here the infrastructures underpinning these service platforms support what is referred to as a "bottom-up transformation of communities." That is, a bottom-up transformation successful in:

- Targeting the social need of communities
- Allowing communities to form a wide range of stakeholder groups from which they can not only develop their own contributions but also learn from studies of successful ventures that are taking place elsewhere in Europe

- Setting up a single agency to oversee the city's ICT developments and manage the underlying infrastructures supporting city service platforms
- Progressively building on the capacity these infrastructures have to develop a more extensive platform of web-based services, capable of closing the gap between what the market offers and communities need in terms of employment opportunities, education, housing, and crime prevention
- Getting these infrastructures to support the delivery of such service platforms to the neighborhoods of New East Manchester
- Closing the gap between the levels of service provision within neighborhoods and across the City of Manchester by basing them on standards of equal measure
- Bridging the "digital divide" by matching the actions taken to meet the social, environmental, and economic objectives with the dividends available to sustain the development of such bottom-up transformations

11.3.3 Phase 3: Next-Generation Broadband

Acting on the success of this bottom-up transformation, the City of Manchester took the decision to consolidate this governance model under the third (post-2004) phase. As they state in the Manchester Digital Strategy Progress Report (Mycio and Carter 2008).

> In January 2007 Manchester City Council submitted the ONE-Manchester Partnership Digital Challenge proposal to Government with plans for developing: "universal, affordable next generation broadband access" which "is essential to connect all residents and businesses of the Manchester City-region to the social, educational, informational and economic opportunities they deserve." (p. 5)

This established the foundation for the creation of a Manchester Digital Strategy offering

> the most advanced 'next generation' connectivity in the UK, providing a sustainable base for high growth business, innovation, transformational public services and an inclusive knowledge society. (p. 5)

The main aim of the project was to provide accessible and affordable broadband, based upon proven state-of-the-art capabilities of fiber and advanced wireless, as is currently being demonstrated across continental Europe. In cities such as Amsterdam and Paris, fiber connectivity is available to all at 100–1,000 times the speed of current UK broadband and at a fraction of the cost.

ONE-Manchester's idea of turning the digital divide into a digital dividend has been about enabling everyone in the community, no matter how excluded and disadvantaged, to gain a stake in the knowledge economy and to use this as a means to provide themselves with a better life, particularly in terms of work, skills, and health.

The first stage of ONE-Manchester's journey of transformation began by focusing on local communities. Examples from New East Manchester (Eastserve) and eTameside demonstrated the potential of community-led ICT programs, the achievements of which can be attributed to user-generated online content. The ONE-Manchester project would therefore draw upon the successes of these local projects to develop a new set of services designed both by and for the user community of citizens and businesses.

The next stage saw the development of a new tool, aimed at providing everyone with the digital technologies able to transform their lives. ONE-Manchester was, therefore, about building on the city's experiences and using the partners' proven track records in delivering projects which transform lives. This started by taking people's real experiences of both the challenges and the benefits of using technologies in this way, illustrated through a series of user journeys based on archetypes developed through community engagement and consultations.

11.3.4 Stakeholder Accounts of the Emerging Governance Structure

Here, the comments of the key stakeholders involved in these ICT-related developments and affected by the emerging system of governance are reported on. These are drawn from a series of structured interviews with 30 members of Manchester's academic, industrial, and administrative communities undertaken in between December 2010 and January 2011. All questions were set in advance by IPPT, with interviews conducted by Edinburgh Napier University. Responses to the questionnaire are grouped according to the sector of the community represented. The interviews were designed to capture the experiences of those within the said communities who had been involved in the ICT-related developments, so as to solicit their views and opinions on the emerging system of governance. The stakeholders were sent the loosely structured and open-ended questionnaires prior to the interviews and asked for their comments on the questions posed. Given the strategic nature of the developments, the interviewees were encouraged to offer a "high-level" account of their experiences.

Reflective in nature, the objective of the interviews was to track what might be best referred to as the discursive elements of the ICT-related developments and to generate critical insights into the emerging governance systems. It was anticipated the insights gleamed from this exploration would not only complement the wider comparable study but also make a constructive contribution to the formation of policy on the development of such systems across Europe. How the questionnaire, loosely structured interviews, high-level accounts, discourse, and critical insights both complement the wider study and also make a constructive contribution to European policy on the development of such governance systems is reported in

Misuraca et al. (2011). What follows restricts this account of the developments and emerging governance systems to the City of Manchester.

The questionnaire is formative in nature, designed to review the developing systems from the perspectives of the key stakeholders, cross-reference their accounts, and authenticate them as part of a triangulation of the underlying discourse on ICT-related city governance. Unlike most questionnaires, it focuses on the experience of the intermediatory stakeholders responsible for developing the city governance systems rather than the user community consuming the services in question. This is because the underlying purpose of the questionnaire is to offer a discursive analysis of the developments and contribute to the ongoing review of the city governance systems emerging across Europe (EUROCITIES 2011).

In view of this, what follows does not attempt to offer a detailed account of the questionnaire, the views, opinions, and comments received from the interviews as some kind of verbatim account of the exchanges. Instead it follows the logic of the exercise by offering excerpts of the responses that manage to both draw attention to and also analyze the discourse as part of an emerging semantic on the city governance system(s). The questionnaire used for the interviews is set out in Appendix.

11.3.5 The Academic Community

Representatives from the academic community cited the obvious advantages of ICT in enhancing the services Manchester offers the city. They acknowledged changes to the internal machinery of governance, such as the committee meetings, planning applications, where online document repositories, e-mail document circulation, and shared databases have led to increased efficiency and transparency. Interviewees also noted that many of the city's services now offer online information and support and commented on what they saw as the city's attempts to engage residents via ICT-enabled resources. However, all of the academic interviewees commented on digital exclusion in Manchester as a key barrier to the city using ICTs to engage the community in decision-making. One respondent commented that, due to the extent of the "digital divide" in Manchester, "online isn't going to replace paper any time soon." It was generally expressed that digital exclusion is part of a far wider problem facing the governance of Manchester, namely, the continued socioeconomic deprivation experienced by a large proportion of city residents.

All of the academic respondents commented on the "pockets of good practice" in digital skills initiatives across the city, mentioning Eastserve, EVHs, and the work of MDDA in supporting business-related IT developments. The coordination of these small projects was questioned, in that the respondents were unclear as to the city's overall strategic direction in terms of rolling out some of the piloted services to the rest of the city, with one respondent suggesting that the "profound lack of coordination" (at senior management level) was to blame.

All respondents agreed that Manchester has responded well to "the Internet revolution" and that the city has been successful in attracting new investment. Indeed, the growth of "media-based activities" was seen as pivotal to the evolution of Manchester as a postindustrial city. One respondent commented on the importance of the city's investment in the broadband infrastructure, noting that it contributes toward making the city more competitive. Communities were also highlighted as beneficiaries of new digitally enabled services, in that such organizations are able to function more efficiently using technology. However, one respondent noted that, to their knowledge, evidence suggests that community organizations only make use of basic technologies to function more coherently rather than more complex applications.

The academics did not, in general, feel that there was much evidence of enhanced citizen engagement using ICTs. One felt there is a problem with participation in general, in that it is currently difficult for citizens to become involved in local strategic partnerships, but did feel that ICTs could make a difference by enabling intelligent, informed conversation among all kinds of stakeholders. Another commented that, despite the city's attempts to tackle the digital divide, "the impact [in terms of] increasing skills and reducing unemployment are not apparent." It was suggested that the city needs to work on building residents' capacity to be involved in the management of their neighborhood rather than simply developing ICT-enabled governance services.

11.3.6 Industry and Local SME Sector in Particular

Representatives from local SMEs made little comment upon the impact of ICTs on regulatory and legal frameworks, but did note that they felt further work needed to be done on this front. One interviewee felt that Manchester could use legislation to enforce sections of the city's digital plan, such as on the issue of inclusion, suggesting that any business wishing to build, for example, a wireless network in the city could be encouraged to implement something similar in another, perhaps in a less "digitally enabled" part of the city, to create a more balanced approach.

In general, the SMEs saw the British model of "siloed" governance as a barrier to the "radical" transformation they thought ICTs could offer. They agreed that cities have the potential to play a significant role in the "information society," but felt the City of Manchester to be relatively slow in developing and implementing its digital strategy. The SMEs interviewed had all been engaged in collaborative work with the city, largely in delivering social inclusion projects. All were very supportive of the MDDA and its role in driving innovation, particularly in the work it undertakes to support the city's SMEs in acquiring the skills they need to survive in the "digital age."

The interviewees recognized the successes the MDDA has achieved in pilot projects, such as Eastserve, but were keen to point out that innovative ICT projects tend

to be localized and that Manchester does not appear to be coordinating the rollout of ICT-driven services across the city. Again, this was seen to be the responsibility of senior management within the city who, the interviewees felt, ought to firmly embed the digital agenda within the city's main development strategy and to "drive change from the top."

11.3.7 The City's Administration

Interviewees from the City of Manchester's administration felt that ICTs had significantly impacted upon the day-to-day running of the city administration. In particular, the city representatives highlighted the increased efficiency of the organization, in that ICTs have allowed the city to reduce its workforce over the last 20 years and automate formerly resource-intensive procedures. The new "self-service" web channels, enabling residents to interact with the city online, were cited as "quicker and more efficient and get the job done more easily," as opposed to the high cost attached to face-to-face work. One representative noted that the savings made in automating certain city services enabled the administration to use these savings in engaging with those residents who require the most support. All the city representatives felt that ICTs offer the potential for the city to make fundamental changes to service delivery, but cautioned that a large number of the city's residents are "still digitally excluded." One representative mentioned a study undertaken by the University of Manchester where approximately two thirds of the residents approached stated that they still preferred telephone or face-to-face interaction with the city, suggesting that there are issues other than lack of Internet access behind the poor take-up of online services.

In addition to ICTs enabling more efficient customer services, city representatives discussed the changes to the back-office structure and working practices of the administration. In 2009 the city appointed an acting CIO from the private sector; under their leadership, Manchester's IT Service was moved from within the Department of Finance to the Department of Transformation and the city's digital strategy was devised. This digital strategy explicitly connected the issues of back-office systems/front-office online service delivery with digital exclusion, clarifying the key role of MDDA as the driver of social and economic regeneration by way of and through the use of digital technologies. All of the interviewees mentioned the ICT problems the city has experienced in recent years, namely, the Conficker virus attack of 2008/2009 which was costly and time-consuming to rectify.

Mobile working was cited as a good example of the advantages of ICT implementation. City staff whose work is based within a specific neighborhood are now able to work within that neighborhood rather than working from a desk in the town hall. One interviewee mentioned the refurbishment of the town hall, which is currently underway, and cited it a good example of the city taking the opportunity to

modernize the working environment. Staff have been moved into a new building for the duration of the refurbishment, and this new building is designed for a mobile workforce: it is open-plan and all desk space is available for any staff member to use. The city's ICT setup allows any staff member to log in to any of the PCs, and, crucially, there are fewer desk spaces than there are staff "on the basis that most people are out-and-about delivering services." Staff working outside of the office use mobile phone and smartphone technologies to connect to the documents they require. The promotion of mobile working has resulted in significant savings, and the newly refurbished town hall will be designed and equipped to support this modernized working environment.

The advantages ICT-enabled services bring to citizens are largely related to their ability to access information online. The interviewees felt that the city's role is "to keep people informed … ensuring that our citizens have access to information." One respondent mentioned that key committee documents are now posted online, such as agendas and minutes, thus opening up the decision-making process to greater public scrutiny. Another mentioned that some city services now make use of social networking tools to keep in touch with customers and to get feedback on services, citing the Library Service and their use of Twitter and Facebook as an example. All interviewees mentioned the Leader's Blog as an example of the city harnessing social networking to open up a "direct communication link" to the top of the council. Through his blog, the Leader is open to questions and criticisms, which city representatives felt contributes toward the increased transparency of the organization. There does not seem to be much interest in using ICTs to enhance public consultations. Representatives mentioned that pilots had very limited take-up and that, "rightly or wrongly, politicians regard [this] as tokenistic." Interviewees felt that the city has strong governance structures in place for public consultation and that it was more important to find the most appropriate ways of engaging with people, in a wider sense, than simply looking at ICT-enabled options.

11.4 Focus on the Next Generation Digital City

Acting on the success of this policy framework, the City of Manchester took the decision in 2007 to consolidate their governance model. They stated, in Mycio and Carter (2008), that

> In January 2007 Manchester City Council submitted the ONE-Manchester Partnership Digital Challenge proposal to Government with plans for developing: "universal, affordable next generation broadband access" which "is essential to connect all residents and businesses of the Manchester City-region to the social, educational, informational and economic opportunities they deserve." (p. 5)

ONE-Manchester did not win the Digital Challenge competition,[2] instead taking the "highly commended" runner-up place, but preparation for the bid included the creation of a Manchester Digital Strategy with a vision of creating the city region as

> the most advanced 'next generation' connectivity in the UK, providing a sustainable base for high growth business, innovation, transformational public services and an inclusive knowledge society. (p. 5)

The digital strategy and its proposals for a "Next Generation Digital City" (Mycio and Carter 2008) aim to provide accessible and affordable broadband which is based on the proven state-of-the-art capabilities of fiber and advanced wireless, as is currently being rolled out across continental Europe. The strategy continues to underline the "ONE-Manchester" notion of "turning the digital divide into a digital dividend," enabling everyone in the community, no matter how excluded and disadvantaged, to gain a stake in the knowledge economy and to use it to provide themselves with a better life, particularly in terms of work, skills, and health (Carter 2009).

The Digital City proposal is aimed at transforming Manchester into a "world-class exemplar" of how digital technologies can be used to support economic growth, continue the transformation of public services, tackle the digital divide, and create "inclusive sustainability." The key driver behind the project is investment in next-generation Internet connectivity, namely, fiber to the premises (FTTP) and advanced wireless. These technologies, particularly FTTP, are currently utilized by cities across Europe, providing the city with a number of case studies in the use of the technology and emerging business models: knowledge and experience the city intends to harness in its analysis of the technological options available.

The creation of "digitally inclusive sustainable communities" remains at the core of the Digital City project. The digital strategy (Mycio and Carter 2008) states that the project

> … includes enhancing the 'sense of place' with digital technologies, being proactive in determining what a particular place, both individual neighborhoods and the city as a whole, needs and what kind of infrastructure and investment is required to meet those needs. We want to ensure that next generation connectivity is, on the one hand as advanced and future-proofed as possible based on the 'open network' principle, and on the other as accessible, affordable and inclusive as possible. (p. 7)

The city's initial objective is to develop the new high-speed Internet network in phases starting in the Oxford Road Corridor and its wider area of benefit, the Central Manchester Regeneration Partnership area. This will deliver next-generation connectivity to residents, businesses, and institutions to support job creation, skill development, business growth, and transform service provision. Further development to expand the network, starting with East Manchester, including the creation of a major Internet Hub, supporting a creative industries cluster at Central Park, will be planned concurrently with the Oxford Road Corridor program in order to maximize local benefit.

[2] Sponsored by the national government's Department for Communities and Local Government.

The city continues to work at national level within the DC10plus network, founded from the ten local authorities involved in the 2007 Digital Challenge competition. The network's vision is to promote technology and innovation as an agent for empowering people and connecting communities. Manchester coordinates the network's next-generation connectivity work-stream, focusing on developing a Living Lab model as a test bed for the development of a "Broadband Atlas" (ONE-Manchester 2007). The Atlas represents an effort to map out broadband supply issues and to stimulate feedback regarding the needs and desires of a broad user community.

11.4.1 Activities and Results

The digital strategy also sets out to enhance the achievements made in the transformation of the city's physical infrastructure over the past decade. This includes adding value to achievements made with inward investment, including MediaCityUK, but also allowing for very rapid expansion for other development sites within Manchester itself, especially in key regeneration areas such as East Manchester. In addition the Next Generation Digital City proposals focus on ways that digital inclusion would support the development of sustainable communities, including new intelligent "eco-solutions" that would have a positive impact in areas such as energy management, more sustainable mobility, teleworking, and telecare applications.

The delivery of next-generation fiber broadband to the regeneration program is of fundamental importance. The rollout is phased, with initial installation to 1,500 homes and businesses in 2010. The immediate impact for the resident and business community is speed of Internet connectivity: the fiber-optic infrastructure promises a minimum of 100 MB per second for both downloading and uploading. The services are available from different providers—in developing an open-access network, this digital infrastructure known as "Corridor Manchester" enables all service providers to lease the optical fiber to provide services to their customers, including TV, telephone, and other data services. In addition to paid services, Corridor Manchester anticipates that some services and applications can be free and intend to deliver innovative public services over the network, such as telecare which would allow patients to connect to their healthcare provider via video link, allowing patients to monitor their health and notify results via the phone line (Corridor Manchester 2010a, b).

The infrastructure itself is intended to encourage innovation by allowing any user to experiment and test content, in a manner likened to income-generating iPhone apps. MDDA currently offers free events on using digital technologies for the voluntary and community sectors.

11.4.2 Impacts on City Governance Developments

From the interviews undertaken, urban regeneration was cited by a number of interviewees in terms of exemplifying Manchester's strong partnerships with the private sector. One city representative spoke of the city as a hub of intelligence and information and that the city's approach is to view everyone as a stakeholder, with the duty to work together "for the good of the whole city." An interviewee from the business sector in Manchester echoed this, reporting on their own involvement in local collaborative projects. These include delivering "digital inclusion projects" in the more deprived neighborhoods, such as social media workshops.

Representatives from the City of Manchester reiterated their commitment to the development of a strong working relationship between the business sector, university, and community organizations. One example provided of this was the Academies program, where the city recognized the skills and experiences of the private sector in delivering education and sought their influence in the design of the Manchester Academies model. The transformation of secondary education marks a strategic response to the pattern of low educational attainment and lack of skills across Manchester's population and reflects the city's efforts to prepare young people for the "knowledge-intensive" employment opportunities available within the city center.

Five new academies have now been built as a result of the £146 m investment. Each academy is sponsored by an industrial partner, from sectors the city describes as, "reflecting future growth." One of the representatives from the private sector (an SME) also highlighted the new Academies model as being "progressive" in terms of the investment in, and deployment of, new technologies. These include a system whereby parents can monitor their child's progress and a cashless biometric thumb print scanner for school lunch payments, in addition to investment in mobile computing technology such as palmtops, pocket PCs, and netbooks. The Academies model is to be rolled out across all the city's secondary schools, with each extending its opening hours enabling community-wide access to the facilities on offer. The key objective in opening the newly refurbished schools to the parents and wider community is to reach people who may not have access to, or knowledge of, ICTs and to enable them to use online city services.

The city's commitment to partnership with its neighboring local authorities is now formalized: the unitary area of Greater Manchester, also known as the Manchester City Region (coordinated through the Association of Greater Manchester Authorities), became a formal administered combined authority in April 2011. Essentially, this constitutes a devolution of powers from the national government to the new authority, including transport, housing, skills, and regeneration. One city representative explained that working as a combined authority, the local authorities could pool their resources "for the common good": pilot projects are currently underway in neighborhoods across Greater Manchester, trialing new methods of delivering public services to families experiencing worklessness.

11.5 Key Findings

In line with the recommendations made by Fourkas (2002), the governance model adopted by the City of Manchester has sought to:

Build upon the success of the 2007 Digital Strategy by providing accessible and affordable broadband, based on the proven state-of-the-art capabilities currently being rolled out across Amsterdam and Paris.

The Digital Strategy continues to underline the ONE-Manchester notion of turning the digital divide into a digital dividend; enabling everyone in the community, no matter how excluded and disadvantaged, to gain a stake in the knowledge economy and use it as a means to provide themselves with a better life, particularly in terms of work, skills and health.

The recent Digital City proposal is aimed at transforming Manchester into a "world-class exemplar" of digital technologies supporting economic growth, transforming public services, tackling the digital divide and creating "inclusive sustainability". The key driver behind the project is investment in next-generation internet connectivity, namely fiber-to-the-premises (FTTP) and advanced wireless. These technologies, particularly FTTP, are currently utilized by cities across Europe, thereby providing the City with a number of case studies in the use of the technology and emerging business models; knowledge and experience it intends to harness in its analysis of the technological options available.

The strategy adopted further enhances the achievements made in the transformation of the city's physical infrastructure. This includes adding value to achievements made with inward investment, including MediaCityUK, but also allowing for very rapid expansion for other development sites within Manchester itself, especially in key regeneration areas such as East Manchester. In addition to this, the strategy also focuses attention on how digital inclusion can support the development of sustainable communities, including new intelligent 'eco-solutions' themed around: energy management, mobility, teleworking and telecare applications.

These developments are of particular interest for the reason they signal a policy shift from the entrepreneurial approaches driving developments embarked upon during the 1990s and towards a model of local government-led actions. For with the latest phase of development (2004 onwards) the City begins to see the emergence of infrastructures not as platforms servicing the market but for governing them on behalf of the community. Here, the market's hold over the development starts to wither away as part of the transition to an electronically-enhanced governance model with the capacity to coordinate, steer and assemble the means needed for communities to access such infrastructures and platform of services they offer. The City of Manchester's experience of these developments suggests there are three components key to their success. These are: access, infrastructures and services and, in particular, user-friendly access to the underlying infrastructures and platform of services.

These bottom-up developments have been successful in targeting the specific social requirements of communities. Community stakeholders are invited into partnerships whereby they can coordinate and steer delivery of the available services

and at the same time learn from similar case studies from across Europe. The success of these community-level interventions has led to the development of a more extensive platform of web services, representing an attempt to close the gap between what the market offers and what the community needs, particularly in terms of employment opportunities, education, housing, and crime prevention. Efforts were made to close the gap between the levels of service provision both within neighborhoods and across the city, by basing them on the same set of standards.

While these developments have been embodied in the digital strategy's proposal to turn Manchester into "digitally inclusive sustainable communities," it is evident that changes to the governance system and anticipated socioeconomic changes they are having are not universally accepted across the stakeholder community. Representatives from the academic community suggested there was too little evidence to suggest that the city's digital inclusion agenda has had any real impact upon socioeconomic deprivation, or community empowerment, with one interviewee commenting

> My own feeling is that most technologies reproduce and perhaps even magnify the kinds of inequalities that already exist in society, and the transformative power of ICTs … is not empirically obvious, and I would be skeptical.

Another commented that

> … despite all the specific policies the actual impact, in terms of increasing skills and reducing unemployment, is not apparent.

The academics expressed concern at the enduring socioeconomic deprivation in the city, referring to the "doughnut of decay" surrounding the (largely regenerated) city center. It was suggested that

> … ICTs can become a palliative and the real problem is poverty … palliatives may have some effect but they don't get to the root of the problem and they certainly don't "solve" the problems that they are touted as being part of the solution for.

Some representatives from the business community remained skeptical of the city's commitment to its digital strategy. One interviewee felt that the city viewed technology as a "threat" and that "they will only [use ICT] to improve public services as long as it doesn't impinge on their own power and authority," going on to make the point that

> … by engaging with ICT infrastructure what you're actually saying is "we're prepared to govern in a different way". I don't think we have a civic leadership that is prepared to accept that.

Another interviewee from the business community envisaged a more transactional model of governance, commenting

> I'd like to see much more information made available so people can start to make decisions about how their communities are run and organized. If they succeed, maybe the Council will trade something.

Manchester's deployment of ICTs has met with considerable success. The ICT-related governance of the city is in many respects exemplary. Over the past 15 years, the city has pioneered the shift from an entrepreneurial model of ICT-related governance to a community-based solution able to support Manchester's high-profile urban regeneration strategy. Targeting the city's social, environmental, and economic aspirations, the growth, competitiveness, and cohesive qualities of this community-based governance model are at the forefront of the drive toward digital inclusion.

MDDA has been key in developing the platforms servicing this ICT-related governance model and innovative features this brings to the city. Nowhere is this currently better exemplified than in the Next Generation Digital City Strategy adopted by the administration to transform the city into a "world-class" exemplar of digital technology with the capacities and physical infrastructure developments needed to meet Manchester's social, environmental, and economic aspirations. Examples of this transformation are found in the development of New East Manchester and MediaCityUK and the Oxford Road Corridor, now forming part of Central Manchester's Regeneration Partnership.

11.6 Conclusions

Given the highly innovative nature of these infrastructural developments, research clearly needs to continue and provide the means to support the significant foresight developments of the kind outlined in this chapter exemplify.

Cutting across all aspects of infrastructure development, the research challenges they posses are notable. Encompassing fiber broadband rollout, platform development and service provision, shall require a multitude of hardware developments, supported by middleware service platforms and software supporting their delivery. It is therefore important to properly theme the research effort and package it so the technical and managerial expertise of the city can be harnessed alongside the major consultancies in the field. This shall require a further consolidation of the efforts made to draw funding from national and international sources and mainstream them into the EU's IST programs in particular.

From the interviews conducted, the stakeholders question how best to integrate these developments into the city's own service platforms. For while many of the interviewees noted the considerable progress Manchester is making to establish itself globally as a Digital City, the existing rollout and distribution of the technologies across the administration is patchy. This suggests there is a need to redress the current balance between the more outward-facing components of the Next Generation Digital City Strategy and use them as a means to support the integration of the administration's public service into this platform. For while some examples of how this is to be done with the likes of healthcare are available, many of the

representatives interviewed were of the opinion that this integration should be mainstreamed across all areas of service provision and therefore include health, education, and housing.

This suggests the challenge which the legacy system poses for Manchester's Next Generation Digital City Strategy should be prioritized as a research challenge, so that claims about their digital inclusivity can be substantiated, not so much in terms of leading edge innovation, but in their diffusion and systematic integration into the emerging infrastructure.

Some of these research challenges include:

- Back-office integration of services, provided across the administration by way of and through a platform able to augment existing provision in line with the technical standards and semantic definitions emerging to support the next-generation fiber broadband infrastructure.
- Use of the said infrastructure to bundle the city's service provision around recognized themes, themselves related to user needs.
- Augmentation of these service bundles via appropriate middleware supporting multichanneled access and packaged to users situated at the front end.
- The development of the city portal as a "single destination point" for service provision across the public domain.
- Use of the portal to develop the city's current level of service maturity, focusing on the augmentation of provision from the level 3 (transactional) to 4 and 5 (the transformational-government stage of development). Those ICT-related developments needed for Manchester to materialize the efficiency gains any mainstreaming of such e-democracy-based service models offer administrations.
- The formation of an action plan for rolling out this digitization of the city's services and diffusion of the technology to support this.
- The need to baseline these developments and use such profiles of service provision as a means to monitor and evaluate what regeneration actions, like those exemplified by the Oxford Road Corridor, contribute to the city.
- The selection of indicators able to measure the performance of such developments in social, environmental, and economic terms and capable of assessing what they contribute to growth, competitiveness, and cohesion.
- The types of partnership agreements best suited to manage such developments across the city and knowledge infrastructures able to sustain the improvements they offer Manchester.

From the strength of the comments received on the experiences of Manchester as a Digital City, it would seem appropriate to apply the innovations embodied in these developments to create a policy commitment that is shared across the administration. In particular, that is shared in terms of an agreed development plan, program of work, set of tasks, and resource base which can be made available to fund their implementation.

Appendix: Interview Questions

Section 1: General

1. What do you consider to be the main challenges those responsible for governing Manchester face?
2. What are the main social and economic challenges Manchester currently faces?
3. How is the city responding to them?
4. What particular action is Manchester taking? Please give examples.
5. What is your organization doing to meet these challenges?
6. What guidelines do you follow in taking in acting on these challenges?
7. What are the aims and objectives of any such actions?
8. What main tasks are you currently involved with?
9. How will completing these tasks change the perception of the Manchester?
10. How shall they improve the image of the city?
11. How will these improvements promote a positive image of the city?
12. How does all of this lead to the perception of Manchester as a "well-governed" city?

Section 2: ICT Developments Within the City

1. What role can cities play in "information society"?
2. How can ICTs enhance life in the city? In Manchester in particular?
3. Have there been any changes to the governance structure of the city (resulting from ICT developments)? If so, how have these changes affected:

   (a) Businesses
   (b) Citizens
   (c) Community organizations

4. [If there haven't been any noticeable changes to date, what changes can you predict, and how might they affect the above groups?]
5. How have these changes affected the quality of service delivery, and what evidence is there to support this (if available)?
6. Have these changes affected residents' satisfaction in service delivery, and what evidence is there to support this (if available)?

   (a) Can you give an example of any opportunities and challenges that can be identified as a consequence?
   (b) What should the city do to respond to these?
   (c) What is it currently doing?

7. Does the city have an ICT action strategy? Can you provide any further information on the development of this?
8. How is ICT used within the city administration?
   (a) How has this evolved?
9. What is your opinion of the current ICT setup within the administration of the city?
10. Has there been a change to the decision-making process within the city? If so, can you provide an example?
    (a) How has this affected your work?
11. How do you keep yourself informed, with regard to the impact of ICTs on the administration of the city?
12. Which topics do you feel well informed on, and which would you like to know more about?
13. How has the city/your department worked to train employees on new ICT developments?
    (a) Do you have any feedback on this?

Section 3: ICT-Enabled Changes in the City Governance System

1. What changes have ICTs contributed to the current governance model in Manchester and in what respect have these changes been made apparent? Please give reference to specific procedures and tasks that have been affected by such changes.
2. Would you expect subsequent ICT systems to further impact upon governance processes in Manchester?
3. In the last 5 years, what have been the main ICT developments that have led to the current model of governance used in the administration of Manchester today?
4. With respect to the impact that ICTs have had on the administration of government processes, which individuals/groups are driving this change and making the key decisions?
5. In your own role, what capacity do you have to influence the uptake of ICTs and subsequently shape the governance model in Manchester?
6. In making such decisions, which other individuals and groups are consulted?
7. What would you say are the main problems experienced by the current model of governance used in the administration of Manchester today?
8. With reference to ICT developments, please outline the extent to which citizens currently participate in the current model of governance in Manchester today?
9. What could be done to improve such citizen participation?

10. With reference to the current model of governance in Manchester, have there been any notable developments that have been primarily driven by the emergence of ICT?
11. What do you think are the opportunities and challenges that exist for the further application of ICT-enabled governance in Manchester?
12. How do you see yourself participating in the future ICT-enabled model of governance in Manchester?
13. In the short term, what improvements to the current model of governance in Manchester could be initiated (primarily) with the support of ICTs?

Section 4: Socioeconomic Implications

1. How is the city's use of ICTs helping to regenerate Manchester?
2. What are the main drivers behind this ICT-related regeneration?
3. What do you think is making such a regeneration of the city possible?
4. What do you consider to be any possible barriers to Manchester's regeneration?
5. What do you consider to be the main risks in the actions the city is taking to regenerate Manchester?
6. How is the city making sure the regeneration of Manchester is well governed?
7. Do you think what Manchester is doing can be said to be a model of "good governance" and other cities would be wise to follow?

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Chapter 12
Analyzing the Digital Divide and Electronic Government Demand: An Empirical Research of the Spanish Case

J. Ignacio Criado and David F. Barrero

Abstract This chapter analyzes the demand side of electronic government (e-government) in Spain. This chapter profiles the features of the users of e-government in Spain and the variables explaining their use of e-government services. In particular, this chapter tackles with the following questions: (1) Which factors predict the use of Internet by citizens? (2) How can the uses of and perceptions about e-government be described? And finally, (3) which factors determine the e-government usage? This set of questions is addressed with the study of national surveys of the Center for Sociological Research (*Centro de Investigaciones Sociológicas*) in Spain, using descriptive analysis, logistic regression, and the innovative technique of classification tree. The main findings of the study are the following: (a) the existence of sociodemographic variables to understand the lack of Internet use, (b) the complexity of the uses and perceptions of e-government users in Spain, and (c) the importance of the frequency of Internet usage to understand the e-government utilization.

12.1 Introduction

This chapter analyzes data about the demand side of electronic government (e-government) in Spain. While the research of the supply side of e-government has grown during the last decade very rapidly, the study of the demand of

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e-government services has not been so intense (Gil-García 2012). Hence, this chapter will profile the features of the users of e-government in Spain and the variables explaining their use of e-government services. In doing so, the study will use data from national surveys and innovative research techniques. Consequently, this study collaborates to understand the nature of digital divide and e-government usage in the Spanish case.

This chapter is rooted in the study of the e-government demand. This strand of the e-government literature has flourished in recent times with some studies and still reflects the lack of scholarly dialogue, in the same vein than other subareas (Rodríguez-Bolivar, et al. 2010). This chapter will try to overcome this problem with the attention to and dialogue with the most recent literature on e-government demand coming from different national contexts, including Australia and New Zealand (Gauld et al. 2010), Canada (Reddick and Turner 2012), Egypt (Reddick et al. (2011), Korea (Choi and Park 2013), Jordan (Al Rababah and Abu-Shanab 2010), Lebanon (Harfouche and Robbin, 2012), Malaysia (Mohamed et al. 2009), or the USA (Nam 2012). At the same time, this chapter will pay attention to the Spanish case, one of the European forerunners in the supply side, at the same time lagging behind in terms of users and demand side, among other aspects (Anduiza et al. 2010; AEVAL 2011; Criado 2010; Muñoz-Cañavate and Hípola 2011).

In particular, this chapter tackles the following questions with regard to Spain: (1) which factors predict the use of Internet by citizens? (2) How can the uses of and perceptions about e-government be described? And finally, (3) which factors determine the e-government usage? These questions resume the research approach to e-government demand, a research topic that traditionally has deserved limited attention in the past.

The analysis of this chapter will use national surveys of the Center for Sociological Research (*Centro de Investigaciones Sociológicas*) in Spain. These studies are based on a sample of 2,500 respondents ($N=2{,}500$) and provide information about the quality of public services, in general, including the digital channel of provision (Center for Sociological Research, 2009, 2010). Particularly, we will present sociodemographic and technical variables to better understand the demand of Internet and the use of e-government. Then, we will deploy a statistical analysis in two phases. On the one hand, a descriptive analysis will be used in order to profile the sample distribution of variables and the uses of and perceptions about e-government. On the other, logistic regression will be applied both for the understanding of the use of Internet and the factors determining the e-government usage in Spain. In sum, this chapter will provide insights on the demand side of e-government in Spain, using reliable data derived from a national survey, and the final purpose of giving ideas with interest both for academics and practitioners.

The chapter has commenced with the introduction. Then, a section drawn on the description of e-government in the Spanish case is developed. The third section acknowledges the study of the demand side of e-government with the literature review. In the fourth section, the data used and the research methods applied in the research are advanced. The results depicted in the fifth section include the descriptive analysis of dependent and independent variables, the Internet usage analysis,

the study of uses and perceptions about e-government, and the e-government usage analysis. The final section, with the discussion and conclusions, completes this chapter highlighting the main findings and future work derived from this research.

12.2 Electronic Government in Spain: From the Supply Side to the Social Demand

Spanish e-government has a success history, similar to other countries. This is specially true when one addresses the supply-side perspective of e-government, while this is not the same taking into account the social demand. This section of the chapter provides an outlook to the advancements of e-government in Spain during more than a decade, in order to encounter the strategic priorities implemented and the position of the citizens in this process.

Firstly, it is worth locating Spain within the *United Nations eReadiness Index* study. The *e*Readiness index for e-government includes *web portals*, *telecommunications infrastructures and uses*, and *human capital* indicators. Even though the correlation between the *e*Readiness index and Internet users is not complete, there is some connection between both variables (above all, among those cases in the top positions). At the same time, it is worth noting the limited development of Internet use in Spanish society, and how this aspect is the principal reason for its position not corresponding with the other indicators in the final measure (United Nations 2003, 2004, 2005, 2008, 2010, 2012). However, during the last years Spain has experimented a noticeable advance in web portals and infrastructures, above all, broadband diffusion, making this case one of the most developed from the supply-side perspective.

In 1999, the Spanish government launched the *Action Plan INFO XXI. An Information Society for All*. This policy document clearly followed the general statements of European institutions from the beginning (*Lisbon Strategy* in 2000) (Criado 2009; Criado 2010). First, it defined a system of emblematic projects, in different policy sectors, to boost e-government (e.g., *e*ID, *e*Social Security, e-Tax, Digital Cervantes Institute). Second, e-government projects were defined as public service digitalization, making them more or less equivalent to e-service delivery improvements. Third, the strategy adopted a positive perspective about the future of ICTs in public administration, sharing the initial approach to e-government at EU level. These three features shaped e-government strategies during the following years in Spain. Thus, the demand side was not of the top areas of interest, even though this broad focus changed with the years.

For instance, in 2006, the Spanish government adopted the *Plan Conecta* as a strategic design to reinvigorate e-government in Spain. This initiative was in line with the focus on e-government as a mechanism to deliver e-services (supply side), but also to improve democracy, sustainability, and the quality of citizens' life (demand side). In the same vein, the EU institutions also prepared the ground for

two other vital areas in the recent e-government projects: inclusion and e-participation (European Commission 2006). Progressively, those policy priorities permeated the Spanish strategy for e-government, while the promise of a citizen-centric e-government design was not yet fulfilled.

Most recently, different initiatives have been oriented to promote the use of e-government among the society. On the one hand, Law 11/2007 (*on citizen's access to public services*) introduced for the first time detailed citizen rights when interacting with government agencies. These rights include the possibility of communicating by digital means throughout all or a part of administrative procedures and not to be required to present repeat personal documents when they are in governmental agencies. In particular, it implies the option of initiating administrative procedures with all governmental agencies and units by digital means. On the other hand, the Spanish government launched the *Electronic National Identity Document* (*Documento Nacional de Identidad Electrónico*) (*e*DNI), adding another crucial step to the certification and identification policy in Spain. Today, the *e*DNI offers the capacity to interact securely on the Internet with all public services, and even private companies, as it is a certified and official (and physical) document for identification of individuals by public officials, with a guarantee for citizens of complete confidentiality.

Other e-government initiatives are also focused on the citizen side of e-government. The open government movement and the adoption of social media technologies in Spanish public administrations have stimulated a citizen-centric approach to e-government. With the philosophy of transparency, participation, and collaboration at its core, the Spanish government has adopted open government and social media ideas to promote the demand of e-government by other means. Here, we highlight, among others, the Decree 1495/2011 on reutilization of public data, Portal www.data.gob.es, *Open Government Partnership* membership, police and other public organizations in social media, etc. At this point, the final impact of these strategy and projects is not clear; however, e-government and ICTs in public administration will rely more on citizen needs in the future than in any other previous period of time.

12.3 The Study of the Demand Side of Electronic Government

This section reviews the literature on the digital divide and demand side of e-government, presents the research questions, and develops the hypothesis of the study. One of the frameworks for the analysis of e-government demand is the "digital divide" literature. The digital divide is commonly known as the difference between the individuals that have access to the Internet and individuals that do not have access or have it with some limitations (Cruz-Jesus et al. 2012; Ferro et al. 2008; Hargittai 2009; Helbig et al. 2009; Warschauer 2003). In brief, the digital divide is associated to demographic characteristics of the individuals.

However, the digital divide is not an easy concept and it has significantly evolved during the last years. Ferro et al. (2011) identify three main approaches to understanding the digital divide: access digital divide, multidimensional digital divide, and multi-perspective digital divide. The first type (*access digital divide*) views the digital divide as a simple separation between "haves" and "haves not" with the attention on access to computers or the Internet. The second type (*multidimensional digital divide*) sees this phenomenon through a complex set of endogenous and exogenous factors involving specific groups of the population. The third type (multi-perspective digital divide) reveals that no any one group of individuals inherently uses technologies differently than others, but recognize that they use ICTs and the Internet for very specific objectives, linked often to their stories and social locations.

The application of the digital divide to the study of e-government reflects the interest to disclose the role of the demand side of electronic public services. Generally speaking, different studies have suggested that young compared with elder people tend to have more access to the Internet and to e-government services. This type of demographic digital divide is also applicable to other demographic characteristics such as gender, education, social class, community size, or political self-identification (Gauld et al. 2010; Reddick 2011; Reddick and Turner 2012). For instance, individuals with university education will have more access to the Internet and more use of e-government than others without university degree. The digital divide is still expected when addressing the access and use of males and females (Al Rababah and Abu-Shanab 2010; Choi and Park 2013), Khan et al. 2010, or groups living in larger communities than others in rural areas, or people with more income respecting to those of lower social class.

In addition, previous studies have pointed out other aspects affecting the demand side of e-government. There exists another type of variables of interest, including the intensity of Internet usage or the perceptions about e-government in terms of trust, satisfaction, and values, "that underlines the of actual government performance since the objective—that is, the idea or notion—of performance only raises citizens' expectations, and if this objective is not achieved, the previously mentioned gap widens. The public expectation-perception gap can lead to a decline in the public's trust of government, a causality that also applies to e-government" Nam (2012: 350). In other words, it is also important to understanding uses of Internet and perceptions of e-government in order to have a complete account of the demand side.

Additionally, recent studies have also pinpointed the importance of channel choice as another source to understand citizens' demand of e-services and e-government usage. Here, Reddick and Turner (2012: 5) suggest that "research shows that individuals that only need information are more likely go online to a website to get information, and individuals that need to solve a problem would most likely turn to the phone or visit an office." In other words, differences in channel choice and e-government usage, in some extent, depend upon the task (Reddick 2010). Then, citizens may choose different contact channels, or a combination of channels, depending upon the type of contact that they have with their public sector agencies.

The previous aspects provide the foundation for the research questions guiding this chapter. Which factors predict the use of Internet by citizens? (2) How can the uses of and perceptions about e-government be described? And finally, (3) which factors determine the e-government usage? These three questions are focused on different aspects of the demand side of e-government in Spain. The first is oriented to identify variables predicting the digital divide in the Spanish case. The second seeks to present some descriptive aspects of the demand side of e-government in Spain, bearing in mind the lack of research about this topic. The third tackles with the most important part of this research, as it focuses on the predictors of e-government usage and how can we categorize this reality.

12.4 Data and Methods

This research will use national surveys of the Center for Sociological Research (*Centro de Investigaciones Sociológicas*) in Spain. These studies are based on a national sample of 2,500 respondents ($N = 2{,}500$) and provide information about the quality of public services, including e-government. The population in the national sample of the questionnaires includes individuals of 18 years old or more, and the methodology included personal interviews developed at the respondent's home. Respondents were asked questions about the general situation of the country, their perception of public administrations, trust and confidence in the public sector, Internet uses, different channel choice to interact with public agencies (personal, telephone, and Internet), and e-government perceptions and uses.

This chapter presents different analytical tools for the analysis and interpretation of the data. We combine different types of analysis, including descriptive statistical analysis to more sophisticated logistic regression analysis, and classification trees. Logistic regression is a quantitative analysis tool that is widely used in the social-science literature and requires little explanation. Classification trees, given its very limited presence in the social-science literature, deserve some words. Data analysis is a field that has attracted much research attention for obvious reasons. Traditionally, this field has been addressed from a mathematical perspective, yielding the well-known statistical tools commonly used in social science. However, in the recent years a bunch of new techniques have emerged from artificial intelligence (AI). In contrast to methods in statistics, AI-based data analysis tools do not rely on sounded theoretical bases, but instead they take an algorithmic approach that tries to learn from data, even when this learning used to have a sophisticated mathematical base. This approach is widely used in computer science and has many applications, including prediction and big data analysis.

From the perspective of AI, a logistic regression can be envisioned as a classifier. A classifier in AI is a system that, given an entity and a collection of categories, maps the entity to the category (Russell and Norvig 2010). In the context of this study, the entities are people, and the classifier categorizes them as e-government users or not e-government users. There are a huge number of classifiers.

In the context of this study, we are interested in a classifier able to provide a data model easily interpretable without technical knowledge. For this reason we have chosen classification trees. From the several algorithms available to construct classification trees, such as ID3 or C4.5, we selected CART (Breiman et al. 1984) for its simplicity and availability in the R statistical framework (data sets and R scripts used in this study are freely available on http://atc1.aut.uah.es/~david/mege2013).

In sum, this chapter provides insights on the demand side of e-government, using reliable data derived from a national survey, and the final purpose of arriving to conclusions with interest both for academics and policy makers. Besides, this chapter innovates with the type of analysis employed (above all, the classification trees) and tries to offer data about a country directly comparable with other cases internationally.

12.5 Results

In this section, the data collected in the questionnaire and its statistical treatment is presented in four separated parts. In the first we show the exploratory analysis of the variables used in this analysis. In the second the Internet usage analysis is developed. In the third the analysis of e-government users and perceptions is advanced. Finally, the fourth part takes into account the analysis of e-government's usage predictors. Hence, this part of the chapter is oriented to deliver the results derived from the analysis in order to open up the following discussion of the final section.

12.5.1 Exploratory Analysis of Variables

To begin with, we present sociodemographic and technical variables to understand the demand of the Internet and the use of e-government. Table 12.1 shows the sample distribution of predictor variables of the Internet use and the use of e-government. Overall, the set of independent variables of this analysis is related to the sociodemographic features of Internet and e-government users: *age*, *gender*, *education*, *social class*, and co*mmunity size*. Table 12.1 also offers information about each factor and their presence in the sample. This group of variables is completed with the factor *political self-identification* that may focus on the importance of the political orientation of the users. Finally, the *Internet intensity usage* is introduced to understand the existence of correlation between this factor and e-government usage.

In addition, Table 12.2 offers the sample distribution of dependent variables. Here we assume Internet usage and e-government usage as dependent variables of the study. In the first case, the question about Internet use categorizes individuals as users if they have utilized it during the last year ("Did you use Internet during the last 12 months?"). On the other hand, using only the group of Internet users,

Table 12.1 Sample distribution of predictor variables

Predictor	Categories/domain	*N*	Proportion/statistics
[P1] Age	Age from 18 years old	2,849	Mean = 47, SD = 17.8 Min. = 18, Max. = 97
[P2] Gender	Male	1,230	49 %
	Female	1,259	51 %
	Total predictor	2,489	
[P3] Education	No formal education	124	5 %
	Elementary school	615	25 %
	High school	1,290	52 %
	College	423	17 %
	Postgraduate	30	1 %
	Total predictor	2,482	
[P4] Social class	Nonqualified working class	358	15 %
	Qualified working class	771	32 %
	New middle class	504	21 %
	Old middle class	393	16 %
	High class	393	16 %
	Total predictor	2,419	
[P5] Community size	2,000 or less habitants	157	6 %
	2,001 up to 10,000 habitants	394	16 %
	10,001 up to 50,000 habitants	637	25 %
	50,001 up to 100,000 habitants	293	12 %
	100,001 up to 400,000 habitants	568	23 %
	400,001 up to 1,000,000 habitants	173	7 %
	1,000,001 or more habitants	267	11 %
	Total predictor	2,489	
[P6] Political self-identification	From 1 (extreme left) to 10 (extreme right)	1,699	Mean = 4.8, SD = 1.8 Min. = 1, Max. = 10
[P7] Internet intensity usage	All or almost all days	922	66 %
	From 3 to 5 days per week	186	13 %
	Once or twice per week	170	12 %
	Sometimes per week	77	6 %
	Less frequency	35	3 %
	Total predictor	1,390	

Source: Own elaboration from CIS study 2840 (2010)

Table 12.2 Sample distribution of dependent variables

Predictor	Categories/domain	*N*	Proportion/statistics (%)
[D1] Internet usage	Internet users	1,394	56
	Nonusers	1,095	44
	Total predictor	2,489	
[D2] eGov usage	eGov users	944	68
	Non-eGov users	435	31
	Total predictor	1,394	

Source: Own elaboration from CIS study 2840 (2010)

e-government usage is identified with the use during the last year ("Did you use Internet during the last 12 months to search information, make a consult or transaction with any public agency?"). At first sight, we see that e-government users are almost 70 % of the Internet users, showing the first data of interest: Most of the Internet users are also users of e-government information and services, although more than 30 % of Internet users who do not interact with the public sector through electronic means still remain.

12.5.2 Internet Usage Analysis

This part of the analysis is based on the Research Question 1: Which factors predict the usage of Internet? In order to outline an answer to this question, we have performed a logistic regression for the usage of Internet. The regression includes the predictive variables shown in Table 12.1, with the exception of Internet intensity usage for obvious reasons. Thus, the regression used age, gender, education, social class, community size, and political self-identification in the model.

Instead of just one logistic regression, and in order to avoid undesirable effects of uncorrelated variables, we computed a sequence of logistic regressions, removing the variables that did not show statistical significance. In this way, we first computed the logistic regression with all the variables and then removed insignificant variables and repeated the regression computation, yielding the result shown in Table 12.3.

The results of the logistic regression shown in Table 12.3 show clear statistical significance with *p*-values lower than 0.001 for age, gender, education, and social class. Political self-identification also presents high significance (*p*-value <0.05); however, the effect is small with a coefficient equal to −0.09, suggesting that conservatives are slightly less likely to use the Internet. Not surprisingly, education plays a major role to predict the usage of the Internet; those people without higher education have less probability to use the Internet. In particular, the model states that no formal education has a dramatic effect with a coefficient that values −17.8; however, the evidence is pretty small (*p*-value values almost 1). Perhaps related with the education, the social class plays a major role. There is strong evidence (*p*-value <0.001) suggesting that nonqualified and qualified working classes are less likely to use the Internet in comparison to new middle class and high class. In the same way, old middle class also tends to use less Internet, but the magnitude of the estimate suggests that the influence is lower. Finally, we appreciate statistical significance (*p*-value <0.001) that males tend to use more Internet than females.

12.5.3 Uses and Perceptions About e-Government

This part of the analysis is based on the Research Question 2. How can the uses of and perceptions about e-government be described? Addressing *perceptions* on e-government, Table 12.4 illustrates the main benefits that citizens see when

Table 12.3 Logistic regression relating variables in Table 12.1 plus Internet usage intensity to eGov usage

Predictor	Categories/domain	Estimate	Std. Error	*z*-Value	*p*-Value
[P1] Age	Age from 18 years old	−0.076384	0.005534	−13.803	<2e−16 ***
[P2] Gender	Male	0.619658	0.151136	4.100	4.13e−05 ***
	Female				
[P3] Education	No formal education	−17.798829	480.014560	−0.037	0.9704
	Elementary school	−2.963797	0.325665	−9.101	<2e−16 ***
	High school	−1.401331	0.282410	−4.962	6.98e−07 ***
	College				
	Post-graduate	−0.074394	0.298245	−0.249	0.8030
[P4] Social class	Non qualified working class	−1.349118	0.313832	−4.299	1.72e−05 ***
	Qualified working class	−1.287856	0.290579	−4.432	9.34e−06 ***
	New middle class	−0.074394	0.298245	−0.249	0.8030
	Old middle class	−0.737579	0.316336	−2.332	0.0197 *
	High class				
[P6] Political self-identification		−0.096633	0.038905	−2.484	0.0130 *

Source: Own elaboration from CIS study 2840 (2010). Significant *p*-value codes: 0 "***" 0.001 "**" 0.01 "*" 0.05 "." 0.1 " " 1

Table 12.4 Potential benefits of using the Internet for administrative interactions

	Principal % (2010)	Principal % (2009)	Difference principal (2010–2009)	In second place % (2010)	In second place % (2009)	Difference in second place (2010–2009)
Eliminate displacements/ traveling	45.4	49.3	−3.9	23.1	20.7	2.4
Time savings	27.7	24.4	3.3	32.7	36.6	−3.9
Government works faster if interactions are digital	2.8	2.6	0.2	4.4	4.9	−0.5
Transactions can be done at any time	11	11	0	20.2	21.5	−1.3
Other answers	0.8	0.4	0.4	0.8	0.6	0.2
No advantage at all	–	0.2	–	–	0.1	–
D.K.	11	11.1	−0.1	14.0	13.6	0.4
D.N.	1.4	0.9	0.5	4.8	2.0	2.8
N	2489	2475		2489	2475	

Source: Own elaboration from CIS studies 2840 (2010). Here, we also use the study 2794 (2009) to contrast the evolution and accuracy of data

Question 37 (study 2840): Independently of whether you have used it or not, what do you believe are the main benefits of the Internet when undertaking official administrative tasks? And in second place?

Table 12.5 Potential inconveniences of using the Internet for administrative interactions

	Principal % (2010)	Principal % (2009)	Difference principal % (2010–2009)	In second place % (2010)	In second place % (2009)	Difference in second place % (2010–2009)
Not having direct contact with someone who could provide information and help to complete the transaction	46.8	45.8	1	15.7	18.9	−3.2
Insecurity of the Internet	21.5	23.8	−2.3	23.3	28.8	−5.5
Make transactions on the Internet is very complicated	7.2	9.9	−2.7	12.1	14.5	−2.4
It is necessary to have electronic identification	4.5	5.9	−1.4	8.7	10.3	−1.6
Other answers	1.6	2.0	−0.4	1.9	1.9	0
No advantage at all		1.1			0.5	
None	2.4			1.0		
D.K.	14.1	10.4	3.7	24.8	19.0	5.8
N.A.	2.1	1.1	1	12.5	6.0	6.5
N	2489	2475		2489	2475	

Source: Own elaboration from CIS studies 2840 (2010) and 2794 (2009)
Question 38 (study 2840): And, what do you believe are the main inconveniences? And in second place?

interacting with government by electronic means. Two categories (*eliminate displacements/traveling* and *time savings*) share most of the first preferences (more than 73 %). The fact that *transactions can be done at any time* seems to be less important (only 11.0 % of the first preferences). There were much lower levels of interest shown by citizens in the potential benefits derived from using the Internet to interact with public agencies.

On the other hand, citizens identify certain aspects as clear barriers to interact with public agencies, when talking about potential *inconveniences* of using the Internet to make electronic transactions. Table 12.5 provides an important finding about the administrative culture of Spanish people as the majority still prefers human interaction with public agencies. Hence, *not having direct contact with someone who can provide information and help to complete the transaction* is the principal inconvenience stressed by citizens to the use of e-government services (46.8 %). Additionally, it is worth noting how *insecurity* is also important (both as principal, 21.5 %, and second option, 23.3 %), even much more intensely than

Table 12.6 Preferred governmental agencies to interact with using digital means

	% 2010*
Tax agency	29.7
Social security agency	9
Police stations	
060 network for citizens' attention	1.9
Employment public offices	6.7
Traffic agency offices	4.1
Central government delegations	
*e*ID office	6.7
Other ministries and agencies of central government	1.6
Agencies of regional governments (health care, education, social care…)	21.7
City councils (local taxes, census offices…)	10.7
Other answers	3.3
D.K.	1.1
N.A.	3.5
N	807

Source: Own elaboration from CIS study 2840 (2010)
Question 21 (2009) and Question 31 (2010): With which public agency did you last interact, with, in order to process or search for information on the Internet?**
*Single answer
**Question only for people who have interacted with government agencies electronically during the last 12 months

problems derived from the *need of electronic identification* and *make transactions on the Internet is very complicated* (4.5 % and 7.2 %, respectively). Various other answers received insignificant percentages.

Additionally, it is also important to review the *uses* of e-government by Spanish citizens. One key point to take into account is the type of administrative transactions that citizens undertake when using the Internet. In this regard, Table 12.6 provides information about the most successful e-government services in Spain: *tax declarations* and *social security benefits*. In the first case, almost 29.7 % of Internet users pay their taxes using the Internet, and in the second case, the percentage of transactions is nearly 9 %. In general, this confirms Spain as being part of an international trend, a fact that is very helpful regarding the finances of governments. Additionally, it should be noted that significant percentages of people now interact to a greater extent with regional governments (21.7 %) than with central agencies, particularly as regions take on responsibilities for basic services like health care or primary/secondary education. Local governments are closer to and more valued by the citizens, although they only receive 10.7 % of the citizens' interactions using digital means. This development carries with it a significant added value for citizens.

Beyond the kind of agencies contacted, data on the types of interactions undertaken (or level of interactivity) is also an important indicator of e-government utilization. Here (see Table 12.7), the informative, non-transactional intensity of exchange between government and citizens via the Internet is clear. Uses related to information retrieval show more willingness above all, to access *information about*

Table 12.7 Types of interactions with public agencies using the Internet

	% 2010*
Looking for addresses and telephone numbers	38
Contact using e-mail	21.7
Access information about the requisites or procedures to interact	
Download forms, files, or software applications	30.4
Make appointments (to register on training courses, medical checkups, renew licenses, etc.)	19.8
Complete transactions (tax payments, obtain licenses, etc.)	35.8
Other answers	4.3
D.K.	0.5
N.A.	1
N	807

Source: Own elaboration from CIS study 2840 (2010)
Question 32 (2010): … And you contact this agency to…?
*Question only for people who have interacted with government agencies electronically during the last 12 months
Multi-answer

Table 12.8 Frequency of e-government use

	% 2010*
From 1 to 10 times	62.1
From 11 to 20 times	9.4
From 21 to 40 times	3.6
From 41 to 96 times	3.6
100 or more	9.0
D.K.	11.3
N.A.	0.9
N	807

Source: Own elaboration from CIS study 2840 (2010)
Question 30 (2010): and during the last 12 months, do you remember the number of times that you have used the Internet to interact with government agencies…?
*Question only for people who have used the Internet and interacted with government agencies electronically during the last 12 months

requisites and procedures of e-services (50.7 %) and *look for addresses and telephone numbers* (19.0 %). Other categories that involve two-way interaction with public agencies are less identified by Spanish e-government users, even though it is remarkable that 35.8 % of them already complete full transactions online.

Finally, Table 12.8 provides data about frequency of e-government usage. This table shows the existence of a group of non-usual e-government users, as they interact with government agencies less than ten times a year (more than 60 %). This supports the idea of the low level of interactions with public agencies using digital means of the citizens. At the same time, there exists a group of experience or regular users overcoming the amount of 100 times per year in the total amount of interactions (9.0 %). In future studies, one may investigate who these two extreme groups

of people are and if they share some common features that correlate with both types of uses (non-frequent and highly frequent).

The analysis of previous e-government usage indicators gives an idea of the social dimension of this phenomenon. Spanish demand for e-government is not as healthy as one may suppose in a country with a strong supply side. On the other hand, there exist some cultural barriers that are not easy to change at this moment, and they make it difficult to improve the use of e-government services and applications. They include some of the abovementioned aspects related to the low rates of Internet usage, limited use of eID cards, or the need of having direct contact with someone who can provide information and help to complete the transactions with government agencies. At the same time, it is necessary to learn more about the usage of e-government in order to identify the existence of predictor variables.

12.5.4 e-Government Usage Analysis

This last part of the data analysis is related to the Research Question 3: Which factors predict the usage of e-government? Here, we use two quantitative tools: a logistic regression and a classification tree. The variables used in both tools are the ones shown in Table 12.1, plus Internet intensity usage. However, it is clear that the Internet usage mediates e-government usage since using the Internet is a precondition to use e-government services. Thus, we have excluded all the subjects that have not used the Internet in the last 12 months. As a consequence, the value of N decreases to 1,394, as Table 12.2 shows.

We followed the same procedure than the Internet usage regression; in the first step we performed the regression with all the predictive variables, removed those variables without statistical significance, and then repeated the regression until all the variables were significant. In this way we remove negative random effects given by the irrelevant variables and reduce the model complexity.

Table 12.9 reports the result of the logistic regression for e-government usage. The regression clearly shows that the most relevant predictive variable is the Internet intensity usage, which achieves the highest statistical significance (p-value <0.001) and coefficients. Internet intensity usage correlates to the usage of e-government; the coefficient is higher when the frequency of Internet usage is lower, and when D1 values are "Less frequency," the coefficient is −1.67; when it is "Once or twice per week," the coefficient is −1.58, and when D1 values are "Sometimes per week," the coefficient is lower, −0.91. Variables P4 (social class) and P3 (education) also show statistical significance lower than D1, but still pretty high. Qualified working class and old middle class have negative coefficients and statistical significance. Education also plays a role to predict e-government usage. It is interesting to note that postgraduate education has a large coefficient, 14.7; however, it is not statistically significant, perhaps because the number of samples is not large enough.

The data analysis gives some conclusion with interest both from theoretical and practical sides. One of them is the existence of some factors predicting the use of

Table 12.9 Logistic regression relating to e-government usage

Predictor	Categories/domain	Estimate	Std. Error	*z*-Value	*p*-Value
[P3] Education	No formal education				
	Elementary school	–0.90719	0.38941	–2.330	0.019827 *
	High school	–0.64104	0.22991	–2.788	0.005300 **
	College				
	Postgraduate	14.70774	506.83074	0.029	0.976849
[P4] Social class	Nonqualified working class	–0.29872	0.32351	–0.923	0.355802
	Qualified working class	–0.67184	0.26905	–2.497	0.012522 *
	New middle class	–0.10176	0.25966	–0.392	0.695140
	Old middle class	–0.89854	0.29834	–3.012	0.002597 **
	High class				
[D1] Internet intensity usage	All or almost all days				
	From 3 to 5 days per week	–0.41979	0.22882	–1.835	0.066565 .
	Once or twice per week	–1.58312	0.43037	–3.679	0.000235 ***
	Sometimes per week	–0.91866	0.21537	–4.265	2.00e–05 ***
	Less frequency	–1.67063	0.34761	–4.806	1.54e–06 ***

Source: Own elaboration from CIS study 2840 (2010). Significant *p*-value codes: 0 "***" 0.001 "**" 0.01 "'*" 0.05 "." 0.1 " " 1

e-government, including the level of education (elementary school and high school negatively correlate with e-government usage), social class (old middle class and qualified working class negatively correlate with e-government usage), and above all, Internet intensity usage (under five times per week of Internet usage negatively correlate with e-government usage). In other words, e-government usage seems to be mediated by the Internet intensity usage, which is more probable to influence the use of e-government than sociodemographic factors.

We have complemented this study using an unusual tool in social sciences: classification trees. We applied a CART algorithm to the predictive variables reported in Table 12.1 plus Internet intensity usage, resulting in the classification tree depicted in Fig. 12.1. There is no need of technical knowledge to interpret a classification tree; however, it is necessary to know that it is composed by two elements, nodes and leafs. Nodes (visualized with an oval) denote a decision, and each node assesses a predictive variable, and depending on its value, there is a branch associated to that value. Leafs (depicted with a square) denote a class, in our case it is binary: a person uses e-government or does not.

The interpretation of the tree requires beginning in its root. The predictive variables with more predictive power are placed close to the root; on the contrary, variables with less predictive power are located deeper in the tree. Each node depicts in its title the majority class that the branch contains and the number of individuals in each class. For instance, the tree root shows that there are more people in the data set using e-government. Nodes also show the number of instances of each class. The root node, for instance, shows that there are 944 e-government users and 435 nonusers.

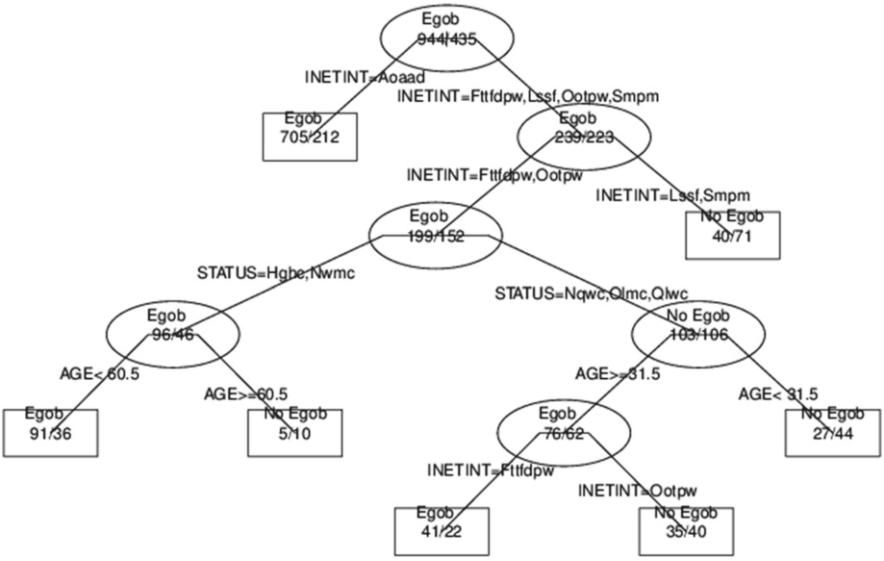

Fig. 12.1 Classification tree for e-government usage. Codification of the variables in the classification tree. INETINT (Internet intensity usage) values: *Aoaad* all or almost all days, *Fttfdpw* from 3 to 5 days per week, *oolpw* once or twice per week, *Smpm* sometimes per month, *Lsssf* less frequency. STATUS (social class): *Hghc* high class, *Nwmc* new middle class, *Nqwc* nonqualified working class, *Olmc* old middle class, *Qtwc* qualified working class. *Source*: Own elaboration from CIS study 2840 (2010)

The classification tree depicted in Fig. 12.1 shows a clear picture: The most relevant variable is the *Internet intensity usage*, which occupies the positions closest to the root. In particular, the model predicts that any person using the Internet all or almost all days is going to use e-government, no matter the other variables included in the study. This rule is able to predict correctly 705 cases, while there are 212 people in the questionnaire that did not use e-government even when they used the Internet intensively. The other extreme of the spectrum is occupied by people who use the Internet in some times per month or less. In this case, the model predicts that they are not going to use e-government services. This rule correctly applies to 71 people, but fails with 40 people. We should comment that the tree is binary, i.e., each node only contains two branches, and hence, the model needs several nodes to express nonbinary decisions like the Internet intensity usage.

The picture is more complex for moderate users of the Internet. In this case, the model states that the usage of e-government services depends first on the social class and then on the age. In the case of high and new middle classes, people older than 60.5 years tend not to use e-government services, while younger people tend to use it. The influence of the age in the rest of the classes is different; people younger than 31.5 are less likely to use e-government services. The model also introduces a new decision based on the Internet intensity usage for people older than 31.5;

however, its poor predictive power and low number of cases suggest that this branch is overfitting, a common problem in any learning algorithm whose consequence is that this branch does not generalize. All these conclusions are coherent with the regression analysis of the previous section.

12.6 Discussion and Conclusion

In this chapter the importance of the digital divide and e-government demand side has been made clear. For that reason, an initial discussion has explored the relation between Internet and e-government usages, presenting the variables to understand the mediation between both phenomena in the case of Spain. Then, using different statistical analyses we have confirmed some of the assumptions of the literature, including the existence of sociodemographic predictors of the Internet usage. At the same time, the understanding of e-government demand side has been developed taking into account that its most relevant predictive variable is the Internet intensity usage. Therefore, in the Spanish case the data validates the role of social use of the Internet in order to understand the supply side of e-government services.

On the one hand, this study has validated the existence of some demographic factors predicting the use of the Internet in Spain. As previous works have suggested, age, gender, education, and social class play an important role in predicting the use of the Internet (Ferro et al. 2008, 2011; Helbig et al. 2009; Manoharan and Carrizales 2011). At the same time, the logistic regression analysis has shown some differences among them, with the education and social class as the most significant variables here. In any case, the attention to this group of variables is important to understand the process of Internet utilization in a society, as recent studies suggest (Cruz-Jesus et al. 2012; Polat 2012). At the same time, the complexity of the digital divide phenomenon implies the need of further research in order to contextualize it.

The uses and perceptions of e-government in Spain reflect some features of this case that are worth to notice. At this point, most of the Spaniards look at e-government as a means to eliminate displacements or reduce waiting times and not as a source of making electronic transactions or increase efficiency in government agencies, which is coherent with foregoing studies in Spain (Criado 2010) and internationally (Harfouche and Robbin 2012; Reddick 2011). In other words, the previous suggests that the citizenry do not see yet the potential of e-government to produce innovations in the process of public service delivery or to improve the transparency or participation. This is also the perspective derived from the analysis of potential inconveniences of using the Internet for administrative interactions, the preferred governmental agencies to interact with, or the types of interactions with public agencies using the Internet. Besides, this is consistent with the analysis of the frequency of e-government use in Spain. Here, the previous pages showed the existence of a significant group (62.1 % of the total) of non-usual e-government users (less than ten times a year), also suggesting the weakness of the demand of electronic services in the Spanish public sector.

In third instance, the analysis of factors related to e-government usage has taken an important role in this chapter. The application of a logistic regression in this case clearly showed that the most relevant predictive variable of e-government is the Internet intensity usage. In some extent, this is consistent with previous studies (Gauld et al. 2010; Reddick 2011; Reddick and Turner 2012; Verdegem and Verleye 2009). In this case the conclusion is more refined, showing that the Internet intensity usage, under five times per week, negatively correlates with e-government usage. At the same time, using a classification tree we have contrasted the previous results, adding more refinement to identify under which circumstances each variable is relevant for the analysis.

Methodologically, this chapter has applied an innovative approach to the study of the demand of Internet and e-government supply side. First, we have used data from a questionnaire with a sample of the total population of Spain. Second, the utilization of logistic regressions has introduced parsimony within the analysis, at the same time that we have applied traditional models to understand the digital divide and the demand of e-government services. In addition, the utilization of the classification tree facilitates the attention to details of the use of the Internet and provides evidence of the existence of a complex reality that is drawn with this technique.

Another important aspect involves the acknowledgement of the complexity of the digital divide and technological cultural inhibitors in Spain surrounding the implementation of e-government. Broadly, Spanish demand of e-government is not as strong as in other countries of its context, even though e-government supply side seems to be comparable (Criado 2010; Muñoz-Cañavate and Hípola 2011). In some extent, the previous is a direct consequence of the lack of Internet penetration through some social sectors, still reluctant to access and use it. And this seems to be equivalent for e-government services. Therefore, public policy should take into account these problematic faces of e-government, above all, if public policy makers wish to overcome potential inequalities in the future.

With the existing e-government developments in mind, it could be possible to make some policy suggestions, particularly on the topic of technological cultural inhibitors. In this regard, demand-side issues should be of more prominent interest for policy makers. Digital literacy, broadband extension, and more complex Internet uses may walk closer to other e-government priorities. On the other hand, public service delivery could be simplified, specially, in those cases with interaction of different levels of government in the implementation process. In addition, e-government should be developed by citizens via open data, open government, social media tools, and the newest trends of technology in public administration. Here, transparency, participation, and collaboration have become the principles of the next revolution within public sector agencies.

This chapter stimulates some avenues for further research in the future. On the one hand, the complexity of the e-government demand, the variety of citizens' needs, and the inadequacy of uniform solutions for them will be part of the future study of information technology in government. Also, the contents of this chapter need to be contrasted with upcoming research about how the public sector organizations are taking actions to fill the gap between the supply and the demand side of

e-government. Last but not least, the application of complex research techniques for data analysis in the study of e-government deserves more attention to the existence of other data sets in other countries and contexts with comparable variables and indicators of the digital divide and e-government demand in order to develop comparative studies.

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Chapter 13
A Quantitative Analysis on the Opinions of Different Stakeholder Groups in Turkish e-Government Transformation

Gökhan İskender and Sevgi Özkan Yıldırım

Abstract This study focuses on the opinions of external and internal stakeholders on the probable success factors that are assumed to be effective on the e-Government transformation success in Turkey. It uses a generic methodology previously developed by the same researchers to collect data from four central and four local Turkish public institutions and applies correlation analyses on the collected data to present its results. Apart from the similar studies in the literature, this study is a multidimensional quantitative one considering the technical, social, organizational, political, legal, and economic dimensions of the subject concurrently, and it uses the data of not only external stakeholders (the set of all stakeholders who only use the e-Government services provided by a public institution) but also internal stakeholders (the set of all stakeholders who only provide the e-Government services in a public institution) while doing its analyses to create an opportunity for the researchers to clearly compare and contrast the perspectives of these two different groups.

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13.1 Introduction

The concept of electronic government (e-Government) is at the intersection of many different disciplines as it includes technical, social, organizational, political, legal, and economic dimensions. As a result of this, there are many definitions in the literature focusing on these different dimensions and it is hard to provide a common definition. A good approach to deal with this problem is to define the concept by focusing on the functions and the outputs rather than the dimensions. One of the best definitions using this approach belongs to Carbo and Williams (2004), which explains the e-Government as

> … the use of information technologies (IT) and, in particular, the internet, to deliver government information and services and to involve citizens in the democratic process and real-time government decision making in a much more convenient, customer-oriented (citizen-centric), cost-effective and potentially altogether different and better way.

The word transformation on the other hand means "a marked change in form, nature, or appearance" (Oxford Dictionaries: Definition of Transformation 2012).

By combining the main essences of these two definitions above, we can define the concept of "e-Government transformation" as "a marked change in the governmental structure to provide improved services to citizens by means of information and communication technologies."

This study focuses on the opinions of external and internal stakeholders on the probable success factors that are assumed to be effective on the e-Government transformation success in Turkey. After presenting the problem and the related literature on the subject, it defines the dependent and the independent variables of the problem, provides a way to collect mathematical values for both types of variables from the research sample,[1] applies correlation analyses on the collected values, and evaluates the results of these analyses to understand the opinions of different stakeholder groups in the society.

13.2 The Problem Statement

The success of e-Government transformation is a multidimensional subject related to two stakeholder groups in the society which are external stakeholders (the set of all stakeholders who only use the e-Government services provided by a public institution) and internal stakeholders (the set of all stakeholders who only provide the e-Government services in a public institution).

[1] The research done up until this point was presented by the same authors as a paper in 18th Americas Conference on Information Systems. This previous study focuses on developing a generic methodology instead of applying it, but this study focuses on applying the developed methodology by using real data and evaluating the results. As this study is a follow-up to the previous one, it briefly re-explains the development phases of the methodology presented in the previous study to provide integrity between two studies.

As a result of this complex structure, some researchers analyze the topic by focusing on the specific problems, while some others try to cover a broader perspective. Although there are a lot of different studies with different rationales, motivations, and focuses, there are two common tendencies in the current studies done over the subject. The first tendency is to do quantitative analyses when the scope is narrower and to do qualitative analyses when it is broader, while the second tendency is to focus on only one group of stakeholders (mainly the external ones) rather than both of them.

While we were doing our literature review, we noticed that there is a limited number of studies analyzing the subject quantitatively but in a broader sense including all of the probable success factors that might be effective on the transformation success. Unfortunately none of these studies is analyzing the opinions of both stakeholder groups at the same time to provide a base for comparing and contrasting the ideas of these two different groups.

This study fills this gap for Turkey, by evaluating all of the probable success factors commonly assumed to be effective on the transformation success in a quantitative way instead of qualitative assessments and by analyzing the opinions of both stakeholder groups about these success factors concurrently.

13.3 Literature Review

The studies dealing with the success of e-Government transformation can be classified under four main groups:

The studies in the first group analyze the effects of the dimensions gathering similar success factors under the common headings, and they generally use the external stakeholders as the main sample group. Some good examples of this approach are the study of Khosrow-Pour (2005) which covers all dimensions of the subject including technical, social, organizational, political, legal, and economic ones; the study of Yang and Maxwell (2011) which associates the transformation success mainly with the organizational and the political dimensions; the study of Verdegem and Verleye (2009) which focuses on the social dimension; and the study of Pardo and Tayi (2007) which covers the technical dimension.

The studies in the second group analyze the effects of a single success factor rather than the effects of the dimensions, and they use either the external stakeholders or the internal ones as the main sample group. Some good examples of this approach are the study of Gagnon (2001) on management support; the study of Evangelidis (2005) on risks; the study of Ferro et al. (2011) on education; and the study of Klischewski and Askar (2012) on interoperability.

The studies in the third group analyze the countries instead of the dimensions or the factors, and they generally use the external stakeholders as the main sample group. Some good examples of this approach are the study of Rehman et al. (2012) on Pakistan; the study of Reddick and Turner (2012) on Canada; the study of Al-Azri et al. (2010) on Oman; and the study of Yun and Opheim (2010) on the USA.

The studies in the fourth group analyze the local government rather than the central government, and they generally use the internal stakeholders as the main sample group. Some good examples of this approach are the study of Reinwald and Kraemmergaard (2012) on Danish local government, the study of Chutimaskul and Chongsuphajaisiddhi (2004) on Thai local government, the study of Weerakkody and Dhillon (2008) on the UK local government, and the study of Tat-Kei Ho (2002) on the US local government.

Neither the studies presented above nor the other ones that we found during our literature search are multidimensional quantitative studies considering both stakeholder groups concurrently, and the main reason of this problem is the existence of the tendencies presented in the previous section.

13.4 Building the Methodology and Developing the Survey

As our aim was to analyze effects of the probable success factors on the transformation success in a quantitative way considering the opinions of both stakeholder groups, we should define the dependent variable and the independent variables of the problem; we should find a way to calculate mathematical values for these variables and we should design a reliable tool (survey) to collect the responses related to these variables in both stakeholder groups. We followed a step-by-step approach to complete these phases.

13.4.1 Defining and Distinguishing the Dependent Variable(s) and Deciding on the Calculation Method for the Scores

In this step, we defined the dependent variable of our research as "the success of e-Government transformation in Turkey" since it was the only candidate consistent with the research context. Defining the dependent variable was easy but finding the subcomponents forming it and distinguishing these subcomponents from the probable independent variables was hard. As a result of this, we decided to use the 10-year update of the IS Success Model created by DeLone and McLean (2003) as a framework because it is an accepted model clearly distinguishing the subcomponents of the success from the independent variables in the IS projects. The 10-year update of the IS Success Model contains a table identifying the subcomponents forming the dependent variable in an e-Commerce project example. We used the same framework and we prepared our own "e-Government Success Subcomponents Table" by updating these subcomponents with the ones customized for the e-Government transformation. This table is presented in Appendix A. The next step was to decide on the way of calculating a single numeric success score from the subcomponents we presented in our newly formed table. Since the categories

classifying the subcomponents in the table might not be equally important for each respondent, using a weighted average method considering the importance of the categories in addition to the scores of the subcomponents was a proper way. As a result of this, we decided to collect the weights of categories concurrently with the scores of the subcomponents from each respondent by using a five-point Likert scale and use these numbers to calculate a single success score.

13.4.2 Defining and Distinguishing the Independent Variable(s) and Deciding on the Calculation Method for the Scores

In this step, we analyzed 100 studies in the literature for the probable independent variables, and we prepared a set of probable candidates for our research. We cross-checked this initial set with the e-Government Success Subcomponents Table and we removed the candidates which had been stated as a subcomponent of our dependent variable to prevent potential conflicts. We prepared an "Independent Variables Table" by classifying the independent variables under the most common dimensions we found during the literature search. This table is also presented in Appendix A. The next step was again to decide on the way of collecting data for all of the independent variables presented in our newly formed table and calculating a single numeric score for each of these values. Apart from the previous discussion, the independent variables were not part of a total at this time. As a result of this, we decided to collect the scores of the independent variables from each respondent by using a five-point Likert scale and use these scores directly since they were reflecting the actual opinion of the respondent about the analyzed independent variable.

13.4.3 Updating the Tables by Delphi Analysis

After forming the tables for the dependent and independent variables of our research, our next step was to design our data collection tool (survey) by using these tables, but before designing it, we preferred to do a Delphi Analysis with 12 experts in the field to update our tables by using the opinions of them. According to the results of Delphi Analysis, one subcomponent and six independent variables were removed from the tables.

The removed subcomponent was "Navigation Patterns" because experts thought that the correct data about this subcomponent should be collected from the analyzed institution instead of the stakeholders and collecting it from the analyzed institution was risky because there was a possibility of alteration by the analyzed institution.

The removed independent variables were compatibility, maintainability, digital divide, transparency, being citizen centric, and accountability because experts thought that these variables had already been presented as another independent variable or they were under the scope of the other ones.[2]

13.4.4 Doing the Validity Analyses and Finalizing the Survey

After updating our tables with the Delphi Analysis, we prepared a draft survey by using them, and we decided to check the content and construct validities of the survey to be sure about its reliability for the intended analyses.

We first checked the content validity using the "Think-Aloud" method developed by Newell and Simon (1972). We gave the draft survey to 20 volunteers and we requested them to read it aloud. We did this to analyze whether we could reflect the intended content to the survey or not and we analyzed their responses. The responses assured the content validity because all of the volunteers clearly understood the questions related to the subcomponents of the dependent variable, the independent variables, and the weights of categories.

Our next step was to check the construct validity using a pilot study. We sent the draft survey to four central and four local public institutions, and we demanded at least five responses from each stakeholder group. We chose the number five intentionally to reach the number of 80 (40 for internal stakeholders and 40 for external stakeholders) since it was the least total sample size calculated for the pilot study.

After the data collection period, the next step was to organize the data and to convert it to a manageable format. We transferred the data to spread sheets and we analyzed these spread sheets to remove erroneous and incomplete responses. The total number of correct and complete responses was 84. Forty-three of them were collected from the internal stakeholders, while 41 of them were collected from the external ones.

We calculated "Cronbach's Alpha" and "Cronbach's Alpha if Item Deleted" values for each stakeholder group and noticed that Cronbach's Alpha values were between 0.7 and 0.9 meaning that the construct validity was achieved. After analyzing Cronbach's Alpha if Item Deleted values, we removed the question about the subcomponent "User Surveys" from the draft survey and finalized it. Because this removal increased the reliability for internal stakeholders, it did not change the reliability for external stakeholders. The final tables used to prepare the final survey are presented in Appendix B.

[2] We classified the independent variables referenced in the text and appendices according to the updates of the experts. For instance, any study analyzing the effects of "digital divide" on the transformation success was classified as a study containing the independent variable "education among stakeholders" since the latter one had a broader definition covering the former.

13.5 Collecting the Real Data

With a finalized survey on hand, our first step was to collect the real data for our analyses. We sent the final survey to the same public institutions to provide consistency between the pilot and the actual study, and we demanded at least 60 responses from each stakeholder group. We chose the number 60 intentionally to provide a room for erroneous and incomplete responses as we needed at least 50 full and correct responses to reach the number of 800 (400 for internal stakeholders and 400 for external stakeholders) since it was the least total sample size calculated for the actual study.

After the data collection period, the next step was to organize the data and to convert it to a manageable format. We transferred the data to spread sheets and we analyzed these spread sheets to remove erroneous and incomplete responses. After completing these analyses, we formed 16 data sets for eight public institutions. Half of these data sets were collected from the central institutions, while the remaining half were collected from the local institutions where each half included two data sheets for each institution one of which was for internal stakeholders while the other was for external stakeholders.

The total number of correct and complete responses was 823. Four hundred and eight of them were collected from the internal stakeholders, while 415 of them were collected from the external ones. From another perspective 411 of them were collected from the central public institutions, while the remaining 412 were collected from the local ones.

For these 16 data sets formed by using the data of eight institutions, we calculated success scores by applying the methodology decided previously, and we prepared 16 success score sheets which included these scores and the scores of independent variables collected from each person.

13.6 Processing the Real Data

As a follow-up to the previous steps, we merged 16 individual data sets into eight bigger data sets. Table 13.1 shows the contents of these data sets.

Table 13.1 The contents of the data sets

	External	Internal	External and internal
Central	Data set 1	Data set 2	Data set 5
Local	Data set 3	Data set 4	Data set 6
Central and local	Data set 7	Data set 8	

For each of these data sets, we did correlation analyses to understand the relationships between the success factors and the transformation success. These analyses are presented in Appendix C.

The initial results of the correlation analyses were usual and expected:

- For all data sets, all of the success factors were correlated to the transformation success significantly meaning there was no need to remove any of them from the analysis set.
- For all data sets, all of the success factors were correlated to the transformation success positively meaning they were increasing or decreasing together at the same direction.

13.7 Discussions

As presented above, the initial results of the correlation analyses which were valid for all stakeholder groups proved that there was a significant and positive relationship between each success factor and the transformation success. As a further step, we compared the individual results of the stakeholder groups with each other to reach the detailed information about the opinions of different stakeholder groups in the society. These comparisons are presented below.

13.7.1 Comparison of Two Different Stakeholder Groups in Central Public Institutions

This comparison focuses on external and internal stakeholders in central public institutions. For the external stakeholders in central public institutions, the most correlated factor to the transformation success is "Management Support," while the least correlated one is "Riskless Environment." For the internal stakeholders in central public institutions, the most correlated factor to the transformation success is "Institutional Support," while the least correlated one is "Interoperability."

13.7.2 Comparison of Two Different Stakeholder Groups in Local Public Institutions

This comparison focuses on external and internal stakeholders in local public institutions. For the external stakeholders in local public institutions, the most correlated factor to the transformation success is "Riskless Environment," while the least correlated one is "Visionary Leaders." For the internal stakeholders in local public institutions, the most correlated factor to the transformation success is "Organizational Transformation Plans," while the least correlated one is "Standards."

13.7.3 Comparison of Two Different Institution Types Apart from Stakeholder Groups

This comparison focuses on central and local public institutions apart from the stakeholder types. For the stakeholders in central public institutions, the most correlated factor to the transformation success is "Political Support," while the least correlated one is "Riskless Environment." For the stakeholders in local public institutions, the most correlated factor to the transformation success is "Accessibility," while the least correlated one is "Political Support."

13.7.4 Comparison of Two Different Stakeholder Groups Apart from Institution Types

This comparison focuses on external and internal stakeholders apart from the public institution types. For the external stakeholders, the most correlated factor to the transformation success is "Management Support," while the least correlated one is "Integrity." For the internal stakeholders, the most correlated factor to the transformation success is "Management Support," while the least correlated one is "Interoperability."

13.8 Conclusions, Limitations, and Future Studies

When we analyze the results of the above comparisons with the dimensions of our independent variables table, we notice that some stakeholder groups think parallel, while some others think completely different while associating the e-Government transformation success with the success factors. The detailed interpretation of our analyses provides us four main results:

- Independent of the public institution types, the total set of all external stakeholders and the total set of all internal stakeholders think parallel while associating the transformation success with the success factors. For both stakeholder groups, the success factors classified under "Organizational Dimension" are more important than the success factors classified under other dimensions, and the least important dimension is "Technical Dimension."
- Independent of the stakeholder groups, the total set of all stakeholders in central public institutions associate the transformation success more with the success factors classified under "Organizational Dimension" or "Political and Legal Dimension," while those in local public institutions associate it more with the success factors classified under "Technical Dimension."

- "Riskless Environment" is the only success factor that is not classified under these dimensions and the two parties above are thinking nearly opposite about this success factor.
- For the whole society, "Support Issues" are always more important than the other issues as we noticed different types of "Support" like "Institutional Support," "Management Support," or "Political Support" in most of the comparisons as the most associated factor.

Our study provides four main results about the relationships between the probable success factors and the success of e-Government transformation in Turkish public institutions by considering the perspectives of both stakeholder groups. These results create a starting point for the future discussions on the opinions of the different groups in the society. The most important thing to keep in mind in any future discussion is the fact that none of these results are universal as the data used to reach them was collected from the internal and the external stakeholders of Turkish public institutions. As the applied methodology is a generic one, any interested researcher can use the same methodology with the data collected from different stakeholders in different countries or regions to analyze the situation in those countries or regions. Another probable alternative might be applying totally different statistical techniques on our data set to analyze the e-Government transformation success in Turkey from a different perspective while yet another one might be repeating the same study with the same sample group after a reasonable time to identify whether there will be any change in the opinions of Turkish stakeholders in the future. We believe the current results of this study, and the potential results of the probable future studies based on the findings of this study will be beneficial for the interested public administrators who are dealing with the concept of e-Government transformation not only in Turkey but also in other countries.

Appendix A

See Tables 13.2 and 13.3.

Appendix B

See Tables 13.4 and 13.5.

Appendix C

See Tables 13.6, 13.7, 13.8 and 13.9.

Table 13.2 Initial e-Government success subcomponents table

Systems quality	Information quality	Service quality	Use	User satisfaction	Net benefits
Adaptability	Completeness	Assurance	Nature of use	Repeat use of e-Government services	Cost savings in public institutions
Availability	Ease of understanding	Empathy	Navigation patterns	Repeat visits	Expanded ways to reach citizens
Reliability	Personalization	Responsiveness	Number of site visits	User surveys	Additional services provided to citizens
Response time	Relevance		Number of transactions executed		Reduced search costs for information
Usability	Security				Time savings for stakeholders

The table is formed by using the framework suggested by DeLone and McLean (2003) and the example metrics provided by the authors in the original paper are updated with the metrics gathered from the e-Government literature

Table 13.3 Initial independent variables table

Technical dimension	Social dimension	Organizational dimension	Political and legal dimension
Compatibility	Awareness among stakeholders	Visionary leaders	Political support
Accessibility	Intention among stakeholders	Accountability	Macro transformation plans
Standards	Education among stakeholders	Organizational transformation plans	Consistent regulatory framework
Interoperability	Digital divide	Management support	
Integrity	Riskless environment	Institutional support	
Maintainability		Institutional culture	
Ease of use		IT investment	
		Transparency	
		Being citizen centric	

Table 13.4 Final e-Government success subcomponents table

Systems quality	Information quality	Service quality	Use	User satisfaction	Net benefits
Adaptability	Completeness	Assurance	Nature of use	Repeat use of e-Government services	Cost savings in public institutions
Availability	Ease of understanding	Empathy		Repeat visits	Expand ways to reach citizens
Reliability	Personalization	Responsiveness	Number of site visits		Additional services provided to citizens
Response time	Relevance		Number of transactions executed		Reduced search cost for information
Usability	Security				Time savings for stakeholders

Table 13.5 Final independent variables table

Technical dimension	Social dimension	Organizational dimension	Political & legal dimension
	Awareness among stakeholders	Visionary leaders	Political support
Accessibility	Intention among stakeholders		Macro transformation plans
Standards	Education among stakeholders	Organizational transformation plans	Consistent regulatory framework
Interoperability		Management support	
Integrity	Riskless environment	Institutional support	
		Institutional culture	
Ease of use		IT investment	

Table 13.6 Correlation analyses (data sets 1 and 2)

Data set 1: correlation analyses between dependent and independent variables			Data set 2: correlation analyses between dependent and independent variables		
Success score	Pearson corr.	1	Success score	Pearson corr.	1
	Sig. (two-tailed)			Sig. (two-tailed)	
	N	207		*N*	204
Accessibility	Pearson corr.	0.294(**)	Accessibility	Pearson corr.	0.428(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
Standards	Pearson corr.	0.250(**)	Standards	Pearson corr.	0.406(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
Interoperability	Pearson corr.	0.238(**)	Interoperability	Pearson corr.	0.368(**)
	Sig. (two-tailed)	0.001		Sig. (two-tailed)	0.000
	N	207		*N*	204
Integrity	Pearson corr.	0.235(**)	Integrity	Pearson corr.	0.426(**)
	Sig. (two-tailed)	0.001		Sig. (two-tailed)	0.000
	N	207		*N*	204
Ease of use	Pearson corr.	0.282(**)	Ease of use	Pearson corr.	0.447(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
Awareness	Pearson corr.	0.265(**)	Awareness	Pearson corr.	0.421(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204

(continued)

Table 13.6 (continued)

Data set 1: correlation analyses between dependent and independent variables			Data set 2: correlation analyses between dependent and independent variables		
Intention	Pearson corr.	0.351(**)	Intention	Pearson corr.	0.440(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
Education	Pearson corr.	0.234(**)	Education	Pearson corr.	0.427(**)
	Sig. (two-tailed)	0.001		Sig. (two-tailed)	0.000
	N	207		*N*	204
Riskless environment	Pearson corr.	0.174(*)	Riskless environment	Pearson corr.	0.399(**)
	Sig. (two-tailed)	0.012		Sig. (two-tailed)	0.000
	N	207		*N*	204
Visionary leaders	Pearson corr.	0.309(**)	Visionary leaders	Pearson corr.	0.454(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
Organizational transformation plans	Pearson corr.	0.319(**)	Organizational transformation plans	Pearson corr.	0.397(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
Management support	Pearson corr.	0.421(**)	Management support	Pearson corr.	0.469(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204

Institutional support	Pearson corr.	0.230(**)	Institutional support	Pearson corr.	0.485(**)
	Sig. (two-tailed)	0.001		Sig. (two-tailed)	0.000
	N	207		*N*	204
Institutional culture	Pearson corr.	0.302(**)	Institutional culture	Pearson corr.	0.409(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
IT investment	Pearson corr.	0.340(**)	IT investment	Pearson corr.	0.415(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
Political support	Pearson corr.	0.416(**)	Political support	Pearson corr.	0.474(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
Macro transformation plans	Pearson corr.	0.338(**)	Macro transformation plans	Pearson corr.	0.466(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204
Consistent regulatory framework	Pearson corr.	0.307(**)	Consistent regulatory framework	Pearson corr.	0.430(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	207		*N*	204

*Correlation is significant at the 0.05 level (two-tailed)
**Correlation is significant at the 0.01 level (two-tailed)

Table 13.7 Correlation analyses (data sets 3 and 4)

Data set 3: correlation analyses between dependent and independent variables			Data set 4: correlation analyses between dependent and independent variables		
Success score	Pearson corr.	1	Success score	Pearson corr.	1
	Sig. (two-tailed)			Sig. (two-tailed)	
	N	208		*N*	204
Accessibility	Pearson corr.	0.401(**)	Accessibility	Pearson corr.	0.419(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Standards	Pearson corr.	0.357(**)	Standards	Pearson corr.	0.250(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Interoperability	Pearson corr.	0.304(**)	Interoperability	Pearson corr.	0.297(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Integrity	Pearson corr.	0.264(**)	Integrity	Pearson corr.	0.387(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Ease of use	Pearson corr.	0.309(**)	Ease of use	Pearson corr.	0.406(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Awareness	Pearson corr.	0.309(**)	Awareness	Pearson corr.	0.362(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Intention	Pearson corr.	0.366(**)	Intention	Pearson corr.	0.290(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Education	Pearson corr.	0.306(**)	Education	Pearson corr.	0.297(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204

Riskless environment	Pearson corr.	0.417(**)	Riskless environment	Pearson corr.	0.312(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Visionary leaders	Pearson corr.	0.254(**)	Visionary leaders	Pearson corr.	0.378(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Organizational transformation plans	Pearson corr.	0.319(**)	Organizational transformation plans	Pearson corr.	0.422(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Management support	Pearson corr.	0.367(**)	Management support	Pearson corr.	0.405(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Institutional support	Pearson corr.	0.307(**)	Institutional support	Pearson corr.	0.367(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Institutional culture	Pearson corr.	0.329(**)	Institutional culture	Pearson corr.	0.309(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
IT investment	Pearson corr.	0.367(**)	IT investment	Pearson corr.	0.281(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Political support	Pearson corr.	0.290(**)	Political support	Pearson corr.	0.270(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Macro transformation plans	Pearson corr.	0.288(**)	Macro transformation plans	Pearson corr.	0.285(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204
Consistent regulatory framework	Pearson corr.	0.329(**)	Consistent regulatory framework	Pearson corr.	0.342(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	208		*N*	204

**Correlation is significant at the 0.01 level (two-tailed)

Table 13.8 Correlation analyses (data sets 5 and 6)

Data set 5: correlation analyses between dependent and independent variables			Data set 6: correlation analyses between dependent and independent variables		
Success score	Pearson corr.	1	Success score	Pearson corr.	1
	Sig. (two-tailed)			Sig. (two-tailed)	
	N	411		*N*	412
Accessibility	Pearson corr.	0.365(**)	Accessibility	Pearson corr.	0.407(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Standards	Pearson corr.	0.337(**)	Standards	Pearson corr.	0.310(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Interoperability	Pearson corr.	0.307(**)	Interoperability	Pearson corr.	0.307(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Integrity	Pearson corr.	0.338(**)	Integrity	Pearson corr.	0.330(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Ease of use	Pearson corr.	0.376(**)	Ease of use	Pearson corr.	0.357(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Awareness	Pearson corr.	0.349(**)	Awareness	Pearson corr.	0.341(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Intention	Pearson corr.	0.399(**)	Intention	Pearson corr.	0.330(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Education	Pearson corr.	0.348(**)	Education	Pearson corr.	0.301(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412

Riskless environment	Pearson corr.	0.300(**)	Riskless environment	Pearson corr.	0.365(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Visionary leaders	Pearson corr.	0.390(**)	Visionary leaders	Pearson corr.	0.322(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Organizational transformation plans	Pearson corr.	0.360(**)	Organizational transformation plans	Pearson corr.	0.373(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Management support	Pearson corr.	0.444(**)	Management support	Pearson corr.	0.385(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Institutional support	Pearson corr.	0.374(**)	Institutional support	Pearson corr.	0.333(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Institutional culture	Pearson corr.	0.361(**)	Institutional culture	Pearson corr.	0.322(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
IT investment	Pearson corr.	0.382(**)	IT investment	Pearson corr.	0.322(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Political support	Pearson corr.	0.448(**)	Political support	Pearson corr.	0.279(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Macro transformation plans	Pearson corr.	0.406(**)	Macro transformation plans	Pearson corr.	0.285(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412
Consistent regulatory framework	Pearson corr.	0.374(**)	Consistent regulatory framework	Pearson corr.	0.337(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	411		*N*	412

**Correlation is significant at the 0.01 level (two-tailed)

Table 13.9 Correlation analyses (data sets 7 and 8)

Data set 7: correlation analyses between dependent and independent variables			Data set 8: correlation analyses between dependent and independent variables		
Success score	Pearson corr.	1	Success score	Pearson corr.	1
	Sig. (two-tailed)			Sig. (two-tailed)	
	N	415		*N*	408
Accessibility	Pearson corr.	0.351(**)	Accessibility	Pearson corr.	0.422(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Standards	Pearson corr.	0.305(**)	Standards	Pearson corr.	0.339(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Interoperability	Pearson corr.	0.270(**)	Interoperability	Pearson corr.	0.334(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Integrity	Pearson corr.	0.250(**)	Integrity	Pearson corr.	0.407(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Ease of use	Pearson corr.	0.296(**)	Ease of use	Pearson corr.	0.425(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Awareness	Pearson corr.	0.287(**)	Awareness	Pearson corr.	0.394(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Intention	Pearson corr.	0.359(**)	Intention	Pearson corr.	0.374(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Education	Pearson corr.	0.272(**)	Education	Pearson corr.	0.367(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408

Riskless environment	Pearson corr.	0.303(**)	Riskless environment	Pearson corr.	0.359(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Visionary leaders	Pearson corr.	0.282(**)	Visionary leaders	Pearson corr.	0.420(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Organizational transformation plans	Pearson corr.	0.319(**)	Organizational transformation plans	Pearson corr.	0.407(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Management support	Pearson corr.	0.395(**)	Management support	Pearson corr.	0.441(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Institutional support	Pearson corr.	0.269(**)	Institutional support	Pearson corr.	0.434(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Institutional culture	Pearson corr.	0.315(**)	Institutional culture	Pearson corr.	0.368(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
IT investment	Pearson corr.	0.352(**)	IT investment	Pearson corr.	0.356(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Political support	Pearson corr.	0.353(**)	Political support	Pearson corr.	0.386(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Macro transformation plans	Pearson corr.	0.313(**)	Macro transformation plans	Pearson corr.	0.386(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408
Consistent regulatory framework	Pearson corr.	0.319(**)	Consistent regulatory framework	Pearson corr.	0.391(**)
	Sig. (two-tailed)	0.000		Sig. (two-tailed)	0.000
	N	415		*N*	408

**Correlation is significant at the 0.01 level (two-tailed)

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Chapter 14
Perceptions About the Effectiveness of E-Participation: A Multistakeholder Perspective

Sonia Royo, Ana Yetano, and Basilio Acerete

Abstract Local authorities increasingly need to demonstrate the legitimacy of their decisions and to develop effective and appropriate forms of citizen engagement. Previous literature has highlighted many advantages of citizen engagement, but has also acknowledged that authentic public participation is rarely found. This chapter uses different sets of empirical data reflecting the opinions of different stakeholders about e-participation initiatives. We aim to analyze whether citizens are familiar with e-participation tools, what citizens and organizers think about the effectiveness of citizen participation, and, finally, whether there is a perceived effectiveness gap between online and offline (traditional) forms of participation. Results show that, despite a high rate of Internet use, the level of use of e-participation among citizens is quite low. Nevertheless, the opinions of citizens and public sector managers regarding e-participation tend to be positive. As regards perceived effectiveness, some differences exist between citizens' and managers' perceptions. Citizens feel that e-participation is less costly and at least as good as offline participation, but it seems that greater changes are achieved through offline participation. Managers tend to agree that online participation is better in reaching a higher number of potential participants, and also in its immediateness and in the lower effort required, whereas offline participation is thought to be better at building social capital.

14.1 Introduction

Citizen dissatisfaction with contemporary democratic practice is more patent than ever. Social exclusion and other impacts of economic restructuring have favored a renewed interest in citizen engagement and citizen participation (Cooper et al. 2006;

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Smyth and Reddel 2000) and a growing reemergence in academic and political discourse of ideas and values of community, localism, and citizen participation (Reddel 2002). The decline of public trust in governments has become a challenge to politicians, public administrators, and citizens because it implies a loss of public confidence in political and administrative performance (Welch et al. 2004). Thus, local authorities and other public sector organizations increasingly need to demonstrate the legitimacy of their decisions, and the development of effective and appropriate forms of citizen engagement is a challenge for them (Cheyne and Comrie 2002; Scott 2006).

Citizen engagement is considered to have positive influences on citizen trust in government (Cooper et al. 2006; Yang 2005), governmental legitimacy (Fung 2006), and governmental responsiveness (Buček and Smith 2000; Yang and Holzer 2006). However, at the same time, the literature acknowledges that authentic public participation is rarely found (Taylor 2007; Yang and Callahan 2007; Yetano et al. 2010). As these authors highlight, administrators are often criticized for promoting their own agendas, as well as for their unwillingness to share power. In addition, administrators may lack the time and financial resources necessary for meaningful citizen involvement to take place (Yang and Callahan 2007). In fact, the skeptical voices about citizen participation have been heard for a long time (Arnstein 1969; Pateman 1970), and it has been questioned whether community participation is an effective policy-making tool (Irvin and Stansbury 2004), whether the participants represent all the different arguments and beliefs of the general population (Davies et al. 2005), and whether it can change the relationship between the citizenry and governments (see Arnstein 1969). Indeed, previous research reflects that participation is not always effective (Cunningham and Tiefenbacher 2008; Rauschmayer et al. 2009).

Some studies have analyzed public administrations' offers of citizen participation, covering both traditional processes and, more recently, e-participation offerings (Mahrer and Krimmer 2005; Musso et al. 2000; Reddick 2011; Scott 2006; United Nations 2012). However, the analysis of the effectiveness of these tools is much less common. In order to fill this gap, this chapter uses different sets of empirical data (surveys) reflecting the opinions of different stakeholders (general population, citizens involved in citizen participation processes, and organizers) about citizen participation initiatives. Where possible, data about the differences between traditional citizen participation versus online participation will be presented with the aim of determining whether the "electronic" component makes a difference or not regarding the effectiveness of citizen participation processes. The research questions that we aim to answer are the following: (1) Are ordinary citizens familiar with e-participation tools? (2) What do citizens and organizers taking part in citizen participation initiatives think about their effectiveness? (3) Is there a perceived effectiveness gap between online and offline (traditional) participation?

This study is useful for two main purposes. First, it shows public sector managers and politicians the views of stakeholders about participation processes. These views are useful for those considering the implementation or improvement of their current citizen participation offerings. Second, it contributes to the academic field with new insights on opinions about e-participation that could be used by researchers and/or

government associations in the elaboration, publication, and/or diffusion of good practice guidelines regarding citizen participation. These guidelines will help governments to overcome the problems and challenges involved in citizen participation. As our results will show, making governments aware of the risks of a symbolic adoption of citizen participation has become imperative.

The rest of this chapter is organized as follows. The next section presents some background ideas about citizen participation and recent developments in e-participation. Sect. 14.3 presents the data used for the study, the results of which will be analyzed in Sect. 14.4. Finally, Sect. 14.5 discusses the findings and practical implications.

14.2 The Rise of E-Participation

Given the increasing imperative for governments to be more responsive to community needs, public sector modernization programs are introducing fundamental changes into democratic practices with the aim of creating new opportunities for democratic participation (Lowndes et al. 2001). Public policy formulation has changed considerably in most developed and developing countries and now involves partners other than public authorities, such as neighborhood associations, private businesses, NGOs, and anonymous citizens. Some authors define these changes as a shift from government to governance (Andersen and van Kempen 2003) or collaborative civic management (IDEA 2001). As a result, nowadays, it is difficult to find a government that is not claiming to be pursuing opportunities for citizen engagement (Burton 2009; Dutil et al. 2007).

In recent years, the use of information and communication technologies (ICTs) and, particularly, the Internet has emerged as a driving factor for citizen participation initiatives because of its potential for informing, educating, and empowering citizens (Thomas and Streib 2005). E-participation aims to promote active citizenship with the latest technological developments in order to promote fair and efficient societies and governments (Sæbø et al. 2008). E-participation efforts can take many forms (see Andersen et al. 2007; Feeney and Welch 2012; Tambouris et al. 2007) that can be classified into three main categories (OECD 2003): information, consultation, and active participation (also known as cooperation). Although, over time, e-participation may lead to better governance and cost reductions in public service delivery, there are many unknown challenges that governments face by involving citizens more in governance (Andersen et al. 2007; Feeney and Welch 2012).

The submission of complaints and proposals by citizens was seen as a basic and easy way to implement e-participation and one which most governments have offered since the early days of e-government. Nowadays, a wide variety of tools are being used, including discussion forums, blogs, wikis, chat rooms, voting systems, and podcasts, in addition to the standard website and e-mail services (Sæbø et al. 2010). Recent developments include the use of Web 2.0 and social media tools (Bertot et al. 2012; Bonsón et al. 2012; Hui and Hayllar 2010; Mergel and Bretschneider

2013; Snead 2013; Zavattaro 2013), which have favored the emergence of citizen-created content that enriches sociopolitical debates, increasing the diversity of opinions, the free flow of information, and the freedom of expression. With the rapid explosion of social media networks, it is no surprise that public organizations are starting to use them to reach people wherever they are, in an effort to improve citizen-government relationships and to draw citizens' attention toward public policy and management. The term Government 2.0 (among others, Bonsón et al. 2012; Nam 2012) has been used to describe government adoption of Web 2.0.

The use of mobile technology, combined with social media networks and Web 2.0 tools, presents exciting opportunities for e-government developments. They offer chances for coproduction, citizen sourcing, transparency and accountability, and real-time information updates (Bertot et al. 2010; Mergel 2013; Nam 2012). According to Joseph (2012), with strategic planning, effective management, and realistic expectations, social computing can drive the next stage of e-government growth and interactivity. These benefits can be obtained by increasing government's visibility; by sharing data and information about decision-making processes; by becoming more engaging, open, and participatory; and by offering all stakeholders the possibility of getting involved in collaborative processes (Mergel and Bretschneider 2013). However, interacting via social media networks also introduces new challenges related to privacy, security, data management, accessibility, social inclusion, governance, and other information policy issues (see Bertot et al. 2012; Joseph 2012).

Nowadays, moving toward the network society and engaging with constituents is understood as a critical element of political legitimacy (Schellong and Girrger 2010). E-participation initiatives are seen as tools for new modes of governance (Bingham et al. 2005) and for integrating civil society groups with bureaucracies (Sæbø et al. 2008). The *Open Government Agenda* of the Obama Administration, the *Malmo eDeclaration on the joint eGovernment strategy* ratified by the EU Member States, and the German government program *E-Government 2.0*, among other initiatives, prioritize citizen participation in government and politics (Schellong and Girrger 2010). English local authorities are now required to develop online petition systems complementary to their traditional offline petitioning channels (Panagiotopoulos et al. 2010). Nevertheless, a recent assessment of e-participation at central level carried out by the United Nations shows that, in general, the level of development of e-participation is still very limited, with the majority of countries offering less than two thirds of all the e-participation services assessed, low rates of adoption of advanced features, and more than one third of the countries not offering any e-participation services (United Nations 2012, pp 45). Similarly, Brainard and McNutt (2010) and Norris and Reddick (2013) argue that e-government has not been transformative, as many early writers envisioned.

Evaluating the level of development of e-participation, though necessary, is only a first step. Citizens and organizers are the main actors of participative processes. So, it is important to evaluate to what extent citizens are aware of these new citizen participation technologies and to what extent they believe that e-participation can make a difference. At the same time, the opinion of the organizers is crucial, as they put e-participation into practice and are supposed to use the results of participative processes.

This study aims to add to the limited number of previous studies that have analyzed managers' and citizens' opinions about e-participation. Among them, it is worth highlighting the works of Feeney and Welch (2012), Mahrer and Krimmer (2005), Reddick (2011), and Reddick and Norris (2013), on the managers' perspective, and Kolsaker and Lee-Kelley (2008) and Thomas and Streib (2005), analyzing citizens' attitudes. In particular, this work focuses on the effectiveness of e-participation versus traditional forms of citizen participation.

14.3 Gathering Opinions About E-Participation: The Surveys

The data used in this chapter has been obtained in the framework of a research project funded by the EU and aimed at evaluating the effectiveness of citizen e-participation versus traditional citizen participation in the field of climate change. The two Spanish local governments selected to cooperate in the project were Zaragoza and Pamplona. Zaragoza and Pamplona are two medium-sized cities usually taken as pilot cities to test new technological innovations in Spain (such as new prefixes for the fixed telephone network, electric vehicle infrastructure, and so on). As of the 1st of January 2012, Zaragoza and Pamplona had 679,624 and 197,604 inhabitants, respectively, being the 5th and 31st Spanish cities in terms of population.[1] The Appendix includes additional statistical information about the profile of the two cities or the regions to which they belong (when data at the city level is not available).

Two similar citizen participation initiatives were carried out during the project in cooperation with these local governments. This allowed the comparison of data coming from two main sources: from the general population and from participants (citizens and managers) directly involved in the two initiatives explained below. The topic was selected due to the importance of individual action in environmental protection and climate change. The literature has emphasized the strong role of stakeholder involvement in sustainability issues (Alió and Gallego 2002; Astleithner and Hamedinger 2003; Few et al. 2007; Portney 2005, 2013; Wang et al. 2012) because a citizen who is well informed about environmental policies and initiatives can become part of the global effort for environmental protection. In fact, participation at the urban level is an integral aspect of how some define sustainability (Portney 2013; Portney and Berry 2010).

Prior to the commencement of the initiatives, data were collected through a random sample telephone survey of 800 citizens in each city in April and May 2010. This survey was carried out through a statistically representative sample of citizens.[2]

[1] Source: Spanish National Institute of Statistics (http://www.ine.es).

[2] The survey was conducted by "Chi-Cuadrado S.L."(http://www.chi-cuadrado.com). A Computer Aided Telephone Interviewing (CATI) system was used. The margin error was ±3.46 for each city and ±2.45 for the total sample of the two cities. More information about the quota distribution of the sample can be obtained from the authors.

It aimed at drawing the profile of citizens in these two cities regarding the topic of the citizen participation processes to be initiated: environmental protection and climate change. Besides general questions related to citizens' awareness and extent of knowledge about these topics, the survey also included some questions related to the willingness of citizens to take part in citizen participation projects regarding environmental protection and previous experience in e-participation initiatives.

The citizen participation processes analyzed in these two cities are as follows. First, we have used data from opinion surveys administered to citizens participating in a long-term cooperation project aimed at the reduction of CO_2 emissions. In this project, citizens committed themselves to measuring and reporting their consumption and habits in different areas (electricity, heating, water, mobility, nutrition, and consumption) over a 2-year period (from 2010 to 2012) in order to achieve a 2 % reduction in their emissions each year. Citizens could participate by using new technologies (e-mail contact and online CO_2 calculator) or by traditional means (contact by post and phone). Throughout the 2-year period, 73 citizens have collaborated in Pamplona (26 online and 47 offline) and 179 citizens have participated in Zaragoza (86 online and 93 offline). Two satisfaction surveys were administered to the participating citizens, one in the middle of the project and one at the end. Response rates to these satisfaction surveys have been quite high. In the final satisfaction survey, we have 46 responses from Pamplona and 124 from Zaragoza, with a balanced distribution among online and offline panelists.

Second, we have used data from opinion surveys administered to citizens and managers, respectively, who were participating in an e-consultation process about possible initiatives to be promoted by the local government in order to reduce CO_2 emissions. According to Taylor-Smith (2010), there are two types of e-consultation initiatives. In the first type, citizens can post their comments simply and quickly and which usually results in a lot of participants and many off-topic or oversimplified posts. The second type, called the "information journey," requires participants to interact with the information before posting. Usually, there are fewer people involved and the outcome is of higher quality. The e-consultations carried out in Pamplona and Zaragoza are of the "information journey" type of e-participation. The e-consultation processes were carried out during April to June 2011 in Zaragoza and during July to September 2012 in Pamplona. In Zaragoza, 231 valid responses from citizens were received. Of the 231 participants, 99 (42.9 %) suggested some possible initiatives to be promoted by the council and 158 (68.4 %) answered some additional questions proposed in order to draw the profile of the participants and gauge their opinion about the e-consultation. In Pamplona, there were 223 valid responses. Of the 223 participants, 146 (65.8 %) suggested some possible initiatives to be promoted by the council and 199 (89.2 %) answered the additional profile questions.

The managers' survey was carried out once the results of the e-consultation process were available to them. The aim of this survey was to know managers' opinions regarding the e-consultation, their degree of satisfaction, and their intention to carry out similar initiatives in the future. Three senior managers involved in the e-consultation process completed this survey in each local government. They had

Table 14.1 Summary of data used

Method	Date	Target population	Code	Sample size
Telephone (profile) survey	April to May 2010	General population	Survey 1	1,600
Opinion survey (interim)	December 2011	Participants of the long-term citizen participation project	Survey 2	209
Satisfaction survey (final)	June to July 2012	Participants of the long-term citizen participation project	Survey 3	170
Opinion survey	April to June 2011 (Zaragoza); July to September 2012 (Pamplona)	Citizens taking part in the e-consultation	Survey 4	357
Opinion survey	October 2011 (Zaragoza); November 2012 (Pamplona)	Managers taking part in the e-consultation	Survey 5	6

relevant positions in the environment and citizen participation departments, in the case of Zaragoza, and in the environment department, local Agenda 21 office, and communication service, in the case of Pamplona.

Table 14.1 shows a summary of the surveys used in this study. To analyze the data, basic descriptive statistics will be used for the first four data sets (Surveys 1–4), whereas a more qualitative analysis will be used for the opinion survey of managers (Survey 5).

14.4 Analysis of Results

The results presented in this section are organized in three subsections, each of them presenting the findings related to the three research questions posed by this study. First, we provide evidence about to what extent ordinary citizens are familiar with e-participation tools. Then, we focus on citizens' and organizers' perceptions about the effectiveness of citizen participation. Finally, we analyze whether there is a perceived effectiveness gap between online and offline citizen participation.

14.4.1 E-Participation Awareness Among Citizens

In order to answer our first research question, data mainly from Survey 1 have been used. As can be seen in Table 14.2, around 71 % of the respondents in both cities are Internet users, and these figures are very close to the statistics for the respective

Table 14.2 Level of use of the Internet and e-participation tools among citizens

	Pamplona		Zaragoza		Total	
	Yes (%)	*N*	Yes (%)	*N*	Yes (%)	*N*
Do you use the Internet at home, at your workplace, or somewhere else?	70.9	800	71.6	800	71.2	1,600
If so, have you ever used the Internet to …?						
… inform yourself about a public issue in a discussion forum	37.9	567	37.2	573	37.5	1,140
… post a contribution in these discussion forums	10.4	567	10.8	573	10.6	1,140
… participate in an online poll about a political subject	15.7	567	17.3	573	16.5	1,140
… chat with politicians	2.1	567	0.9	573	1.5	1,140

Data source: Survey 1

Table 14.3 Previous experience in e-consultations

	Pamplona		Zaragoza		Total	
	n	%	*n*	%	*n*	%
Yes	137	68.8	91	57.6	228	63.9
No	60	30.2	66	41.8	126	35.3
Not answered	2	1.0	1	0.6	3	0.8
Total (*N*)	199	100	158	100	357	100

Data source: Survey 4

regions reported in Appendix. Those respondents that declared themselves as Internet users were asked some additional questions about the use of some e-participation tools.

Table 14.2 shows that the level of use of e-participation tools by citizens is almost the same in the two cities. Around 38 % of Internet users have obtained information about a public issue in a discussion forum on the Internet. However, only around 10 % of Internet users have posted contributions in these discussion forums. Participation in online polls about political subjects is somewhat higher than participation in forums (around 16 % of Internet users). Very few respondents (1.5 %) have participated in an online chat with politicians, which was foreseeable as the use of this type of online tools has been unusual among Spanish local governments (Royo et al. 2011).

Survey 4 also offers some insights about the first research question. Citizens taking part in the e-consultations were asked about their previous experience with this type of tools, and as can be seen in Table 14.3, most participants had previous experience (around 64 % on average). The percentage of citizens with experience in e-consultations is slightly higher in Pamplona than in Zaragoza (68.8 % versus 57.6 %). However, the fact that for 35 % of the respondents this was their first experience with e-consultations reveals that they have not yet become a common activity in Spain.

Overall, these results provide evidence that a high proportion of citizens are regularly using the Internet, but mostly for work or leisure purposes. Among Internet

Table 14.4 Satisfaction with the participation

	Online		Offline		Total	
	Yes (%)	*N*	Yes (%)	*N*	Yes (%)	*N*
Improved awareness of CO_2 emissions	82.9	105	90.8	65	85.9	170
These projects are inefficient	18.1	105	18.5	65	18.2	170
The results will be taken into account by politicians	49.5	105	69.2	65	57.1	170
Lack of opportunities to incorporate citizens' views into political decisions on environmental topics	93.3	105	86.2	65	91.1	170
Satisfaction with the project	96.1	105	93.8	65	93.5	170
I have considered dropping out	11.4	105	12.3	65	11.8	170
I would repeat my cooperation in topics important for my city	92.4	105	78.5	65	87.6	170

Data source: Survey 3

users, the use of e-participation tools is limited among Spanish citizens. These results are foreseeable given the recent (and limited) development of advanced e-participation tools by Spanish public administrations (Bonsón et al. 2012; Royo et al. 2011). In any case, a certain degree of reluctance to participate by using new technologies can be appreciated among Spanish citizens, since using forums for getting information is much more common than participating with a contribution on these forums. Nevertheless, the results suggest that citizens that participate tend to repeat the experience, as the average number of experienced participants in the e-consultations is higher than in the general population (Survey 1). In fact, as we will show below, our results confirm that citizens taking part in e-participation processes are willing to participate in the future.

14.4.2 Citizens and Organizers' Perceptions About the Effectiveness of Citizen Participation

Table 14.4 reports the opinions of citizens participating in the long-term project related to the reduction of CO_2 emissions (Survey 3). There are hardly any differences in the opinions of participants in the two cities, so the table does not distinguish by city. The majority of the participants, with small differences between the online and offline groups, agreed that they are more informed about CO_2 emissions after participating in the project. Thus, the first objective of citizen participation ("information") has been achieved in this experience. Moreover, the perception of participants about this type of projects is positive, as most of them consider that these projects are efficient. With regard to the impact of the results, around 57 % of participants believe that politicians will use the results of the citizen participation project in future decisions. However, it should be highlighted that most citizens (91 %) miss a greater involvement of citizens in political decisions and that offline participants are more optimistic about the use of their input by politicians (69 % versus 49 %), perhaps due to direct personal contact among citizens, politicians, and

Table 14.5 Achievements of the participation

	Online		Offline		Total	
	Yes (%)	*N*	Yes (%)	*N*	Yes (%)	*N*
When thinking of your participation in the initiative, do you have the feeling of acting as part of a community?	81.2	133	82.9	76	81.8	209
Due to participating in the climate initiative, I have changed						
… my habits regarding electricity consumption	68.4	133	81.6	76	73.2	209
… my heating habits	61.7	133	68.4	76	64.1	209
… my travel habits and commuting habits	45.1	133	65.8	76	52.6	209
… my consumption habits	58.6	133	77.6	76	65.6	209
… my nutrition habits	38.3	133	55.3	76	44.5	209

Data source: Survey 2

public sector managers in traditional forms of participation. In general terms, citizens were satisfied with the project and this explains why only a low percentage considered dropping out and why most of them would repeat their participation in other topics important for their city. It is noticeable that online citizens are more willing to repeat their participation. This may be because taking part has been more convenient for online participants (they could complete the measurements through the online CO_2 calculator at their own convenience, instead of receiving periodic phone calls from the research team). Another explanation for this may be the different level of expectations (Font and Navarro 2013): as offline participants had higher expectations, they can more easily be disappointed.

As can be seen in Table 14.5, the majority of the citizens feel part of a community when participating in this type of collaborative climate initiatives. Additionally, citizens were asked about their changes in habits. It can be seen that most participants say that they have changed their habits regarding electricity, heating, and consumption. Travel and nutrition habits show the lowest levels of change. It is noticeable that offline participants perceive that they have changed to a greater extent than online participants. This confirms that the protection of the environment can be achieved through citizen participation.

Managers' perceptions are extracted from Survey 5. Four of the six senior managers said they were satisfied, in general terms, with the e-consultation carried out. The three managers in Pamplona are satisfied, whereas only one out of three in Zaragoza is. The managers in both cities indicate a low level of satisfaction with the number of participants in the e-consultation. As regards the number of comments and contributions, we find mixed results. Managers in Zaragoza are only partially satisfied with the number of suggestions. In Pamplona, the managers responsible for the local Agenda 21 and the environment department are very satisfied with the number of comments and suggestions received from citizens, whereas the manager responsible for communication is not satisfied in this regard. As Zaragoza is much bigger than Pamplona, and the number of contributions is significantly lower, this could explain the lower levels of managers' satisfaction in Zaragoza. As we will see

Table 14.6 Best way to make concrete suggestions

	Attending a public discussion meeting (%)	Internet (e.g., online forum) (%)	Indifferent (%)	No reply (%)	*N*
Pamplona	54.6	33.9	5.9	5.6	800
Zaragoza	52.4	33.9	7.1	6.6	800
Total	53.4	33.9	6.4	6.0	1,600

Data source: Survey 1

later on, managers in both cities expected higher participation rates. Nevertheless, it should be taken into account that the topic under consultation (to propose other measures that the City Council could take to reduce CO_2 emissions) was, perhaps, too specific for ordinary citizens to have an informed opinion.

As regards the impact of the e-consultation, all the managers agree that the proposals are partially viable and that some of the comments are feasible to be included in the policies of the municipality. In Pamplona, the managers agree that there is a chance for local environmental policies to change because of the new insights obtained from citizens. However, in Zaragoza there are doubts in this regard.

Managers were also asked about the benefits of the e-consultation for the local government. All the respondents agree that the most important advantages are an improved image and transparency. Other important benefits, obtaining a lower level consensus among managers, are projecting that the local government is testing new forms of governance, giving citizens a feeling of enhanced influence on the development of the policies of the local government, and encouraging citizens to act more responsibly. However, these benefits are not so clear when evaluating whether the initiative has had a positive effect on other citizens that have not participated.

In general, public managers consider that all the aspects included in the questionnaire as possible drivers of successful citizen participation (cost for participants, set of clear objectives, support activities, credible use of citizens' opinions, transparency of the process, and feedback on the contributions of participants) are very important.

14.4.3 Effectiveness of Online Versus Offline Citizen Participation

Survey 1 gathered citizens' opinions about the best way to make suggestions about local government actions with regard to the reduction of CO_2 emissions. As can be seen in Table 14.6, just over half of the respondents considered that offline participation was better. Around 34 % of the respondents indicated that online participation was better, and around 12 % were indifferent or did not answer this question.

Additionally, in Survey 4, citizens were asked: *This consultation has been done via the Internet, but it could also have been done by traditional means (such as phone, mail or in person). Taking into account the following aspects, what is, in*

Table 14.7 More appropriate type of participation (in the eyes of citizens)

	Offline is more appropriate (%)	Online is more appropriate (%)	Both equally (%)	Not answered (%)	*N*
Cost for you	3.6	60.2	34.5	1.7	357
Cost for the local council	4.8	70.3	22.4	2.5	357
Quality or interest of the contributions of the participants	7.8	39.5	46.2	6.4	357
Participants represent a relevant part of the whole population	25.5	23.8	45.9	4.8	357
To revise and change personal attitudes and opinions	9.5	39.5	43.7	43.7	357

Data source: Survey 4

Table 14.8 Level of effectiveness of e-consultations (in the eyes of citizens)

Effectiveness of e-consultations in comparison to …	Higher influence (%)	Less influence (%)	The same influence (%)	Not answered (%)	*N*
Discussion forums	50.4	25.8	20.4	3.4	357
Demonstrations	37.5	33.1	23.8	5.6	357
Petitions	42.6	25.8	23.5	8.1	357
Protest e-mail	44.5	26.9	22.1	6.4	357

Data source: Survey 4

your opinion, the most appropriate means of participation? Responses were very similar in Pamplona and in Zaragoza, so Table 14.7 includes the responses of citizens in these two cities.

As can be seen in Table 14.7, there is a broad consensus among citizens that have participated in at least one e-consultation initiative that online participation is more appropriate in terms of costs both for participants and the local government. As regards the quality or interest of the contributions made by participants, although 46.2 % of the respondents agree that both types of participation yield contributions of similar quality, 39.5 % think that online participation provides contributions of higher quality. Similar results are obtained when citizens are asked about the possibility of revising and changing personal attitudes and opinions, with 43.7 % of respondents thinking that both types of participation are similar in this regard, but 39.5 % consider that online participation is better. As regards the representativeness of the participants, 45.9 % of the respondents think that online and offline participations are no different in this regard.

Table 14.8 also reports results of Survey 4, in this case, about the perceived level of effectiveness of the e-consultation carried out in comparison to taking part in other initiatives. As can be seen, most respondents think that taking part in an e-consultation is more effective than other forms of participation, perhaps because

this is a government-led initiative, whereas the other options are usually unsolicited forms of citizen participation. The highest levels of disagreement are found when comparing e-consultations to demonstrations, as 37.5 % participants think that an e-consultation has a greater influence, whereas 33.1 % think that a demonstration has a greater influence.

In Survey 5, managers were also asked to compare online and offline participation, in order to ascertain which of them they think will become the most successful in the future. They all agree that the online option will be better in terms of the number of participants and, to a lesser extent, in terms of effort and immediateness. However, most managers agree that offline forms of participation will be better for establishing contacts with other participants and organizers and for increasing the feeling of working with others toward a common goal. As regards the value of the content of the contributions and its influence on the political agenda, most managers think that there will be no differences between the online and offline forms of participation. Regarding the opportunity to bring in new ideas and the representativeness of the participants, there is no clear consensus about which method will have more advantages in the future.

14.5 Discussion and Conclusions

The objective of this chapter was to analyze the perception of stakeholders about the effectiveness of e-participation. Firstly, we aimed to ascertain the level of knowledge of ordinary citizens about e-participation tools. Results have shown that, in general terms, citizens are using the Internet to a great extent, but their engagement in e-participation initiatives is very limited. It is also noticeable that citizens mainly use the Internet in order to obtain information on public topics, rather than making an active use of online tools (participating in online polls and chats or posting their comments in discussion forums), which is consistent with the previous findings in the USA (Reddick 2011; Thomas and Streib 2005). However, these low involvement rates should not be attributed solely to a lack of citizen interest because citizens are often confronted with a lack of possibilities due to the low use of e-participation tools by public administration (Bonsón et al. 2012; Brainard and McNutt 2010; Norris and Reddick 2013; Royo et al. 2011; United Nations 2012; Yetano et al. 2010). Moreover, the fact that citizens who participate tend to and are willing to repeat their participation suggests that public sector entities should increase the number of participation possibilities and broaden their scope to different areas of public sector management. However, we have to bear in mind that personal experience with participatory instruments does not automatically bring about a positive view of them (Font and Navarro 2013). A necessary precondition for citizen satisfaction is a well-crafted process.

Citizen participation is useful for coproducing public services and for helping citizens to understand community problems and how they are solved. We aimed to evaluate the perception of citizens involved in participation processes about the

effectiveness of these initiatives. In general terms, our results show that citizens that take part in citizen participation initiatives are satisfied with the process. As regards the initiative itself, after participation, citizens felt more informed about the topic concerned, and they indicated that they have changed their behavior; so information, and to some extent coproduction, was achieved. Citizens think that citizen participation is efficient, they are willing to take part in future participative projects, and many of them consider that politicians will use the results. Citizens who expect more from local participation (like people who expect more from other local policies) can also be more easily disappointed (Font and Navarro 2013). So, the entities carrying out e-participation processes of any kind should take these high citizen expectations into account and inform citizens about the final results of the participative processes and the actions taken in order to demonstrate how citizens' opinions have been incorporated into the final decisions.

Managers are the other side of the coin of participation processes, so their opinion on their effectiveness is also necessary in order to have a global picture. In general terms, managers were satisfied with the results, although they expected a greater number of participants. The low level of participation may be due to a lack of habit in this respect. Citizens will also refrain from participation if trust is absent (Klijn et al. 2010). In some cases, a very specific topic may also hinder participation. Citizens proposed some ideas that were considered feasible, but rather than considering this as the main positive outcome, managers saw e-participation as a tool to improve transparency and image. Thus, managers seem to know the "theory" of citizen participation, without applying all these basic principles "in practice." As said before, their expectations of a higher level of contributions were not realistic given the specific nature of the e-consultation. Furthermore, no feedback to participants was provided and the results of the citizen participation processes were not made available to the general public on the local government website. This should be improved in the future as citizens need to know whether their contributions have been taken into account or, at least, that citizen participation is not a "hollow exercise" (Feeney and Welch 2012; Halvorsen 2003; Nam 2012; Yang and Callahan 2007). Just as use begets further use, failure to deliver the benefits deemed essential by citizens can reinforce reluctance to engage (Kolsaker and Lee-Kelley 2008). If routines for citizen participation are established but politicians do not use the input they receive, the net effects on public trust in government may be negative rather than positive. Governments should take this into careful consideration because previous research has shown that trust increases the probability that citizens will invest their resources, time, and knowledge in participation, thus creating stability in the relationship and providing a stronger basis for cooperation (Klijn et al. 2010; Reddick 2011; Tolbert and Mossberger 2006).

Additionally, we have compared online and offline participation in order to establish whether a perceived effectiveness gap between the two types of participation exits. Citizens feel that e-participation is less costly, but it seems that offline participants hold greater expectations and also that greater changes are achieved through traditional means. Citizens with experience in e-consultations tend to think that e-participation is more appropriate or at least as good as traditional forms of

participation, which is consistent with the previous findings in the UK (Kolsaker and Lee-Kelley 2008). If experience influences use and value perceptions, as our results suggest, then governments should find innovative ways of getting citizens online and promoting use of e-participation applications, for example, by providing high-quality information, services, and applications online; by promoting free Internet access and/or support staff in libraries and other public places; or by giving publicity to existing e-participation initiatives (Kolsaker and Lee-Kelley 2008; Reddick 2011). There is a broad consensus among managers that traditional forms of citizen participation will obtain better results in building social capital, whereas e-participation is thought to be better at reaching a higher number of potential participants, and because of its immediateness and the lower effort required. Therefore, before deciding which type of tool to use (online/offline), public sector managers should carefully consider what the main objective is and then decide which tool should be used. Nevertheless, it could be argued that a combination of both types is the best option, as e-participation has greater diffusion.

The combination of sources used in this study has advantages and disadvantages. On the one hand, we have been able to combine the opinions of the general population, participants, and managers with regard to citizen participation in climate change and environmental protection. On the other hand, the opinions of participants and managers refer to a specific participation project. This is a commonly adopted form of obtaining information, but not one that is intended to achieve any kind of representativity. Moreover, the views of managers in this chapter have the characteristics of a case study, as we only obtained the opinion of those managers involved in putting the initiatives into practice. So, the number of managers' responses is low and the generalization of their opinions must be carried out with caution. Nevertheless, their opinions are of great value as they have participated in the design of the initiatives and the use of the outcomes. Furthermore, the initiatives in which they were involved are fully comparable.

To conclude, we have seen that citizens seem to believe in the virtues and benefits of e-participation as they are satisfied and willing to repeat. By contrast, managers are still reluctant to use citizen participation for anything beyond improving their image and transparency. This may explain the low level of development of consultation and cooperation initiatives among public sector entities as well as the low level of use of e-participation tools among citizens despite the high level of Internet use among the general population. Previous research has found that managers' perceptions of the outcomes of e-participation initiatives are significantly related to the number of channels used and the frequency of use (Feeney and Welch 2012). So, the fact that managers affirm that citizens' comments and contributions are partially viable and that some of the comments are feasible to be included in the policies of the municipality suggests that there will be a greater use of e-participation tools by public administrations in the near future. In any case, it is crucial to make public managers and politicians aware of the benefits and challenges of citizen participation, and the publication and/or diffusion of high-quality guidelines and reports based on existing research is a necessary first step. Future research will also need to address the current challenge of finding relevant motivational elements for citizens to engage in citizen (e-)participation initiatives.

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Appendix. Profile of Pamplona and Zaragoza

	Pamplona	Zaragoza	Source of data
Population (1st of January 2012)	197,604	679,624	INE
– % of males	47.8 %	48.4 %	INE
– average age	43.3	41.8	INE
Area (km^2)	25.24	973.8	INE
Density of population (inhabitants per km^2)	7,829	697.9	INE
Average per capita net income (euros per year) (regional data, 2010)	13,986	11,759	INE
Average household net income (euros per year) (regional data, 2010)	21,127	17,473	INE
% of citizens that have accessed the Internet in the last 3 months (regional data)	72.4 %	72.7 %	INE
Level of education			
– Primary or no studies	30.1 %	33.8 %	Survey 1 (see Sect.14.3)
– Secondary or vocational education	35.4 %	34.6 %	
– University	34.5 %	31.6 %	
Employment status			
– Employed	62.3 %	57.5 %	Survey 1 (see Sect.14.3)
– Unemployed	4.5 %	7.5 %	
– In training	3.6 %	3.4 %	
– Retired	23.9 %	18.5 %	
– At home (without own income)	5.8 %	13.1 %	

Note: INE (Spanish National Institute of Statistics)

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Chapter 15
Conclusion

Manuel Pedro Rodríguez-Bolívar

Abstract This book has sought to make a critical view of e-government developments from the point of view of the perception of stakeholders about e-government projects and their effects. In this section, a trip across all chapters included in the book is performed, highlighting the main results of the research undertaken in each one of them. All these chapters make high-quality contributions into e-government research and set the base on which future developments on e-government efficiency studies could be built. In general, e-government developments seem to be positive for citizen engagement and for efficiency in public sector tasks, but the implementation of e-government projects needs to consider some main internal and external challenges that have been identified in the empirical studies included in the book such as employee training in new technologies, privacy and data security, greater involvement of citizens in public sector management, or the need to change government culture.

15.1 Concluding Remarks

As noted in the introduction, this book has sought to make a critical view of e-government developments from the point of view of the perception of stakeholders about e-government projects and their effects. In fact, the book seeks to answer some research questions such as the following: (a) How can e-government efficiency be measured? (b) How do stakeholders perceive the developments made in e-government projects? (c) Do stakeholders think that e-government projects change the way in which public managers and politicians face their relationship with them or do stakeholders think that e-government is only the application of new technologies to the traditional relationship with them? (d) Do public managers think that e-government is positive for their work?

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In this milieu, this book has included some chapters that analyze the measurement of e-government efficiency from a theoretical lens (first part of the book) and, later, other chapters that seek to identify this efficiency from an empirical point of view, capturing the perception of the main stakeholders of e-government projects (second and third parts of the book). To achieve this aim, in the introduction an overview of the current state of e-government research has been presented. It has concluded that a research gap exists regarding the need of analyzing efficiency of e-government projects.

Later, in the first part of the book, some studies regarding the measurement of e-government efficiency are included. In this regard, in Chap. 2, José-Rodrigo defines three conceptual patterns of practice to help stakeholders engage with evaluation activities and positively improve the influence of e-government in society. These patterns foster joined-up thinking and collaboration between stakeholders while empowering them to contribute to e-government evaluation and societal improvement and have the potential to generate a learning system about e-government policy and its evaluation or measurement that could benefit governments, other stakeholders, and society in general.

Then, two studies about the measurement of specific aspects of e-government projects are shown in the following two chapters of the book (Chaps. 3 and 4). This way, Sanja Bogdanović-Dinić et al. propose a new approach to the evaluation of open data with real-world application capabilities, which relies on eight open data principles. As a confirmation of this model's capabilities, Sanja Bogdanović-Dinić et al. illustrate the results of its application on seven data portals along with analyses, comparisons, and conclusions regarding the results. The authors indicate that "open" is not the same as "transparent." By contrast, data transparency is an important aspect for analyzing open data, and it is defined through data authenticity, understandability, and reusability. In Chap. 4, Thomas Zefferer et al. conduct a usability analysis of three core components of the Austrian e-government infrastructure to improve efficiency in this domain. The evaluated components act as middleware and facilitate integration of e-ID and e-Signature tokens such as smart cards and mobile phones into e-government applications. They found that the Mobile Phone Signature turned out to be the clear winner in terms of popularity, security, trustworthiness, and usability. Therefore, they indicate that reliance on mobile technologies and solutions appears to be promising also for future developments.

Finally, in Chap. 5, Lasse Berntzen proposes two approaches that include a set of indicators together with a methodology to use these indicators to calculate the efficiency gain of using electronic services, both from citizen/business perspective and administration perspective. The first approach requires collection of quantitative data from both users and the administration and calculates the efficiency gain. The second approach is less rigorous, but still useful to prioritize between different services.

In the second part of the book, four chapters seek to capture if public managers and policy-makers think that e-government policies have improved their management and decision-making process through the engagement of the citizenry or else they are only a procedural improvement through the introduction of new ways of delivering public services or disclosing public sector information. In this milieu, the

first chapter of the second part of the book, written by Mark Liptrott, undertakes a research into variables influencing Election Officers' decision-making on e-voting adoption in the UK with additional data from a senior executive of the Association of Electoral Administrators (AEA). The main conclusion of his study suggests that the values and beliefs of actors involved in local e-policy adoption decision-making are pivotal. It further suggests that there are practical steps that, if taken by policy-makers, have the potential to address mechanisms that influence against voluntary e-government policy adoption.

Later, Gabriel Puron-Cid undertakes a research using a questionnaire about different dimensions of e-government efficiency applied over government officials who participated in a contemporary case of e-budgeting (Chap. 7 of the book). The results indicate that the development of e-government initiatives involves more than just technical aspects such as defining strategies and goals toward cost savings, improving public services, strengthening accountability, and enhancing ICT innovation. Furthermore, several internal management benefits were also revealed. Therefore, reformers and designers of e-government should recognize the different perspectives of e-government efficiency from different participants in the initiative in order to facilitate the consolidation of e-government impact in the organizations and public services.

Laura Alcaide et al. perform a survey on e-government efficiency addressed to the IT managers of Andalusian municipalities with over 20,000 inhabitants. Results indicate that the IT managers of large municipalities are more strongly aware of budget cutbacks and report increased difficulties in financing their e-government projects. In addition, IT and operational staff lack the necessary skills to undertake and participate in e-government initiatives and usually present resistance to change, especially in the smaller municipalities. On the other hand, e-government initiatives are not affected by problems of data security, privacy, or bandwidth and increase the efficiency of business-associated processes, reducing both processing time and administrative costs. In any case, the results of the respondents are heterogeneous which is accounted for by sociodemographic variables and by political factors.

In the last chapter of the second part of the book (Chap. 9), Dennis de Kool indicates that, for civil servants, the utilization of social media brings both challenges and risks. He makes his study based on two theoretical frameworks: a "classical" and a "modern" approach to civil servants. The respondents in his research value their own expertise and professionalism highly. In addition, they sometimes make the pragmatic choice to bypass communication advisers in online communication. It makes that the governmental culture, which is based mainly on the closeness of government organizations, needs to require a reconsideration to make governments stay "connected" to the networked society.

Finally, the third part of the book has analyzed if main external stakeholders like citizens or providers perceive e-government projects as efficient. The first chapter of this part (Chap. 10) analyzes stakeholder view on e-government from the public sector management. Tommi Inkinen and Maria Merisalo identify three main discourses on e-government: efficiency and e-government, e-government as a tool for improving democracy and participation, and potentials for cross-sectional transforming

government. They indicate that the main questions about e-government projects concern the role of private sector involvement, privacy and data security, and legislation.

In Chap. 11, Mark Deakin et al. explore the governance of the ICT-related developments responsible for transforming Manchester into a "digital powerhouse" and challenges the City's recently announced "Next Generation Digital Strategy." They think that to apply the innovations embodied in developments to become a Digital City, it is necessary to create a policy commitment that is shared across the administration, in particular, in terms of an agreed development plan, program of work, set of tasks, and resource base which can be made available to fund their implementation.

On the other hand, Ignacio Criado and David F. Barrera analyze data about the demand side of electronic government in Spain and reach the conclusions that the demand of e-services depends on some variables such as sociodemographic variables, the complexity of the uses and perceptions of e-government users, and the frequency of Internet usage to understand the e-government utilization.

In Chap. 13, Gökhan İskender and Sevgi Özkan analyze the opinions of external and internal stakeholders on the probable success factors that are assumed to be effective on the e-government transformation success in Turkey. Their study provides four main results about the relationships between the probable success factors and the success of e-government transformation in Turkish public institutions by considering the perspectives of both stakeholder groups. Based on the results of the study, the "Organizational Dimension" and "Support Issues" are usually more important than the other dimensions and issues for the stakeholder groups analyzed.

Finally, in the last chapter of the book, Sonia Royo et al. perform an empirical research about e-participation. Although citizens and public managers think that e-participation is positive, results indicate that the level of use of e-participation among citizens is quite low. As regards perceived effectiveness, some differences exist between citizens' and managers' perceptions. Citizens feel that greater changes are achieved through offline participation, whereas managers tend to agree that online participation is better than offline participation, which is thought to be better at building social capital.

In sum, the book collects relevant studies that highlight the need for efficiency measurement of e-government projects and the empirical research on the impact and success of some e-government developments. Therefore, this book sets the base on which future developments on e-government efficiency studies could be built. In general, e-government developments seem to be positive for citizen engagement and for efficiency in public sector tasks, but the implementation of e-government projects needs to consider some main internal and external challenges that have been identified in the empirical studies included in the book such as employee training in new technologies, privacy and data security, greater involvement of citizens in public sector management, or the need to change government culture.

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