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Preface

EGOV 2007 was the sixth edition of this highly successful series of annual international conferences dedicated to electronic government research and practice. Like all its predecessors, EGOV 2007 achieved a remarkable number of paper submissions. Moreover, the quality of this year's submissions again superseded previous years' submissions. For the third year in a row, the conference was anteceded by a doctoral colloquium, with approximately 20 PhD projects discussed. The conference also provided a forum for academic work in progress, for practitioner reports, and for workshops on specialty topics.

Along with the International Conference on Digital Government Research (dg.o) in the USA and the e-Government Track at the Hawaii International Conference on System Sciences (HICSS), the EGOV series of conferences has established itself as the leading annual conference on e-Government, e-Participation and e-Governance in Europe, with a global reach.

Last year, the first two professional societies were formed in North America and Europe, the Digital Government Society of North America (DGSNA)¹ and the European EGOV Society (EGOV-S)². Both sister societies work closely together. It is noteworthy that both societies have adopted almost identical mission statements. They both define themselves as multi-disciplinary organizations “*of scholars and practitioners engaged in and committed to democratic digital government. Digital (or electronic) government fosters the use of information and technology to support and improve public policies and government operations, engage citizens, and provide comprehensive and timely government services*”. The societies equip their “*members with a professional support network focused on both scholarship and effective practices that nurture technical, social, and organizational transformation in the public sector.*” As a result of this orientation, the scholarship in e-Government enjoys a growing respect in academia and a high recognition for its relevancy to practice and governmental transformation. It appears the e-Government study domain is on a good path.

The growing number of high-quality research that we witness at e-Government conferences has also increased the demand for domain-specific journal outlets. At least six journals with an international distribution have emerged in the last couple of years.

In the Call for Papers this year, a number of topical threads were highlighted which attracted a fairly large number of paper submissions. Thirty-eight full research papers (empirical and conceptual) were accepted for the LNCS proceedings of EGOV 2007. They have been clustered under the following headings:

¹ <http://www.dgsociety.org/>

² <http://www.egov-society.org/>

- Research Foundations and Frameworks
- Process Design and Interoperability
- e-Services
- Policies and Strategies
- Quality Assessment and Evaluation
- Democracy and Participation
- Status of e-Government Developments.

EGOV 2007 also covered a number of contributions that reflect ongoing and innovative contributions, case and project descriptions, as well as workshop abstracts. These contributions are published in a complementary proceedings volume by Trauner Druck.

Many people make large events like EGOV 2007 happen. We thank the members of the Program Committee and additional reviewers for their great efforts in reviewing the submitted papers. Gabriela Wagner of the DEXA organization as well as the EGOV 2007 Program Committee members deserve special thanks. Bernhard Szudra of the University of Koblenz-Landau/Germany was a key support in the administrative management of the review process, the set-up of the program and coordination of authors' requests, as well as in compiling the proceedings of EGOV 2007.

This year for the first time we awarded outstanding papers at the EGOV conference. The conference closed with the awards ceremony, during which the winners were announced. We judged papers in three categories:

- The most novel and innovative contribution
- The most compelling research reflection
- The most promising contribution

Since innovation, reflection, and great contributions were his academic signature, we decide to name these awards after René Wagenaar.

René unexpectedly passed away in February this year at age 55. He held the position of Professor of Information and Communication Technology in the Infrastructure Systems and Services Department at the Technical University of Delft, The Netherlands. René was a very prolific and intellectually influential colleague. He also stood out as a great mentor to students and junior colleagues. René had an irresistible sense of humor and cheered up many meetings with his joyful presence. His early death is a tragedy and a great loss to both his family and the academic community. We miss him immensely, and we are proud to honor his contributions to our community in this way.

September 2007

Maria A. Wimmer
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Developing an E-Government Research Roadmap: Method and Example from E-GovRTD2020

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Abstract. Modern governments using innovative ICT have become an increasingly important factor of competitiveness and growth in the European Information Society. Public institutions are forced to improve their operation to become more efficient and effective. As a consequence, modern ICT heavily impacts and forms Government activities in cooperating and interacting with their constituencies. The use of ICT is expected to enable performance of business processes, integration of back-office systems among public (and private) sector, and provision of fully customized and personalized electronic services to the different stakeholders. To investigate what kind of research is needed to spur innovation in the public sector, the European Commission has funded eGovRTD2020, a specific support action in the 6th Framework Program of IST. This contribution introduces the roadmapping methodology developed in the course of the project. Its application is exemplified with the description of a future research theme for advancing eGovernment towards innovative governments in 2020.

Keywords: eGovernment research, science and technology roadmapping.

1 Visions and Current State of eGovernment Research

New opportunities offered by the advent of the Information Society force not only the business sector, but also governments all over the world to improve their operations and become more efficient and effective. As a consequence, modern Information and Communication Technology (ICT) heavily impacts and shapes Government activities for cooperating and interacting with the constituencies (i.e., society, citizens, businesses, citizen groups, NGOs and other government agencies within countries and across borders). The much-discussed concept of joined-up government services through one-stop-shops is a quintessential example of the positive results that can emerge from the affinity between ICT and public sector modernization. Such initiatives provide more convenience, better quality, and reduced administrative burden on citizens and businesses.

A modernized ICT-enabled government is acknowledged as a key precondition in promoting the growth and competitiveness of the European Information Society. When considered as a single entity, government is by far Europe's biggest economic sector: overall government spending across EU-15 amounted to about 49% of GDP in 2003 [12] and affects all other sectors of the economy. Given this sheer size, it is increasingly evident that governmental efficiency results in important performance improvements and cost savings. Similarly, an increase in the efficiency and effectiveness of public sector management of the economy and society substantially reduces the administrative burden government imposes on businesses and citizens, which in European countries is particularly high. The first OECD study conducted in 2001 on this topic showed that the average cost of this burden on only the business branch in Europe is equal to 2% of GDP, and can reach as high as to 7% [15]. According to predictions for 2005-2010 eGovernment research and implementation programs could boost EU's aggregated GDP by 1.54%, or by 166 billion Euros ([4], p. 15).

Despite the many potential benefits of using modern ICT, governments still struggle with the problems of rigid, ineffective business processes. Some reasons of insufficient use of ICT are the large heterogeneity, fragmentation and inability of information systems to interoperate. Furthermore, business processes are not properly designed for effective implementation through modern ICT. Governments' cooperation with other government agencies and with society (citizens and businesses) is in most cases realized only in limited scopes. Fully customized and personalized electronic public services are still a vision far beyond reality. Yet, electronic collaboration without the necessity of physical contact is a path not to underestimate for certain electronic services even in the public sector.

The European Commission initiated a great deal of research and pilot implementations in eGovernment related research. Also, the National Science Foundation in USA provides funding to spur innovation in digital government research. At national level, funding mechanisms are also in place in Canada, Australia and e.g. New Zealand to advance eGovernment developments. In contrary, the state of play analysis, which was performed in eGovRTD2020 in the first half of 2006, unveiled that most national initiatives in eGovernment developments in Europe focus on ICT deployment and implementations without accompanying research (Bicking and Wimmer, 2006). European countries have started only recently to install national innovation programs to advance eGovernment developments in research and implementation. Examples of funding mechanisms to support focused eGovernment research in European Member States are e.g. UK, Italy, and Sweden. These mechanisms have been launched in the course of 2006, or in early 2007, and the thematic focus is mostly on eParticipation.

Expectations of research and implementation in eGovernment are very high. Yet, many investments have not met the visions and reached the maturity aimed at. What are the deficiencies of current developments in eGovernment? And which role does research play in advancing the field? It is an urgent need to facilitate an open discussion about the future strategic development of eGovernment and the public sector. To transform the European Government landscape into a coherent community anticipating customer needs and making use of the available potentials of innovative ICT, several issues must be reflected and investigated carefully: multidisciplinary,

current deficiencies and challenges of eGovernment research, complexity of the field, and future visions.

In this scope, the European Commission has funded eGovRTD2020, a project to investigate eGovernment research. eGovRTD2020 aimed at analyzing the current state of play and at developing future research themes for eGovernment based on visionary scenarios, which depict governments using modern ICT for their efficient service provision and effective interaction with their constituencies in 15 years from now. The contribution embarks on work previously published: the holistic understanding of eGovernment [19], the state of play in eGovernment [1], the eGovRTD2020 visionary scenarios of governments in 2020 [2], and an analysis of gaps in current eGovernment research [16][17]. In the next section, we reflect existing roadmapping methodologies for strategic programming. Thereafter, we introduce the eGovRTD2020 roadmapping methodology, provide an overview of results gathered, and show an example of a research roadmap. We conclude with reflections on the roadmap results and the impact aimed at.

2 Policy-Oriented Methods for Roadmapping Technology Research

In the last decade, technology roadmapping (TRM) has become a widely used approach by individual companies and large industries [13] to chart an overall direction for technology development or usage [11][13]. In the most traditional sense, TRM aims at supporting the development of new products by establishing causal or temporal relations between the technological options and the business objectives thereby highlighting the necessary steps to reach the market with the right products at the right time [10]. Robert Galvin, former Motorola chairman and advocate of science and technology roadmaps, defines a roadmap as *“an extended look at the future of a chosen field of inquiry composed from the collective knowledge and imagination of the brightest drivers of change in that field. Roadmaps communicate visions, attract resources from business and government, stimulate investigations, and monitor progress. They become the inventory of possibilities for a particular field”* [9]. A technology roadmap provides a consensus of a view or vision of the future science and technology (S&T) landscape available to decision-makers [12].

In a broader perspective, technology roadmapping can be seen as a tool for research & development portfolio management. It provides forward-looking insights for linking the allocation of resources (investments or financing decisions) to strategic goals in an increasingly complex and fast changing environment. A roadmap attempts to make decisions to take more intelligible.

Roadmapping is gradually developing into a new discipline as numerous studies have been devoted to the theory and methodology of roadmapping (see e.g. [11][18]). The practices of technology roadmapping (TRM) are diverse and methodologies have yet to reach maturity. TRM is still developing from an art to a discipline, from exploring a spectrum of methodologies for different goals and situations into systematically applying basic principles and methods [8]. An examination of existing roadmaps unveils a considerable diversity among practices of roadmapping as shown in Table 1.

Table 1. Three categories of roadmapping

	Corporate TRM mid 1980s	Industry TRM early 1990s	Policy-oriented S&TRM late 1990s
Scope	One product or a family of products	A technological sector (mono-disciplinary)	Wide S&T areas or whole S&T landscape seen from an "issue-driven" approach and extended upstream to fundamental scientific r.
Objectives	Optimizing R&D decisions, strategic planning for development of new products	Becoming more competitive by sharing R&D investments and results in the pre-competitive domain	Providing the intelligence needed for optimizing public R&D investments and ensuring their relevance to society
Methodology	Compilation of technical documentation, internal ws	Workshops with industrial and academic experts	Workshops with various experts and stakeholders, large scale semi-public or public conferences
Approach to the future	Technology-driven and/or market-pull; Descriptive and normative: What are we going to do?	Technology-driven Forecasting and normative: What will happen? and What should we do?	Problem-driven (also technology-driven) Proactive, today's policies contribute to shape the future, "the future depends on us", multiple possible futures
Time Horizon	Short term, typically 5 years	Medium term, typically 5 to 10 years	Typically 15 to 25 years, connecting long-term socio-economic issues (e.g. demographics, geopolitics, societal concerns and demands, etc.) to shorter-term foreseeable technological developments

Product or corporate TMRs have evolved since the 1980s to forward-looking instruments used to support the development of new products by highlighting the necessary steps to reach the market with the right products at the right time [10]. In the case of corporate roadmapping, the goals are defined easily [5]: optimizing R&D decisions; strategic planning for development of new products; or more generally delivering the right products to the right market at the right time. A typical example is the US-based 'National Technology Roadmap for Semiconductors' (NTRS), first developed in 1992. It has since evolved into a world-wide collective reference document for the semiconductor industry, i.e. 'The International Technology Roadmap for Semiconductors', first published in 1999.

Since the mid-1990s, various trans-disciplinary think-tanks or public agencies have sought to adapt TRM methodologies to the process of policy-making in areas where science and technology plays a prominent role [5]. The main objective of such policy-oriented science & technology roadmapping is to provide the strategic intelligence needed by policy-makers to optimize public research and development investments and to ensure their relevance to society. In public funded research, the programs of funding must look beyond the perspective of a single product or a single industry as these must (by their institutional mission) ensure that the public money invested is used to help respond to challenges that are relevant to society as a whole. For

instance, the priorities of scientific and technological research and development of the EC IST framework programs 4 to 6 were always driven by wider societal challenges. Future R&D needs to address such challenges, too.

3 Methodology for Roadmapping eGovernment Research

When roadmapping eGovernment research programs, the focus of the roadmapping exercise can neither be that of a single technological product nor of a single ICT industry. A holistic perspective reflecting a dynamic and open socio-technical system is crucial. It needs to bear in mind technological developments and the corresponding industries, whilst also investigating the broad socio-cultural, socio-political and socio-economic trends. In-depth analysis and reflection of the demand side (user needs, resistance, and cultural barriers) and of the sovereign's side (political, institutional and regulatory dimensions) are to be included in the roadmapping exercise.

The roadmapping methodology of eGovRTD2020 is driven by the multidisciplinary nature of eGovernment, and it bases on a holistic reference framework (cf. [19]). The eGovRTD2020 approach is a policy-oriented science & technology roadmapping, which differs from more common product and industry technology roadmapping as follows:

- Its scope is defined by societal ‘challenges’ reaching out widely rather than a technological product or industry per se; hence
- The scope is larger as it must move further upstream beyond technological developments into fundamental scientific multidisciplinary research (technological, social, cultural, political, legal, etc.) in order to envisage the potential future applications and implications; and
- To optimize public research and development investments and to ensure the relevance thereof to society, these must encompass the economic, institutional, political and social dimensions, and the complex interactions between them.

In brief, roadmaps for policy intelligence in eGovernment research as to be applied in eGovRTD2020 have a longer time horizon; must integrate roadmapping and scenario-building techniques; have to start from main societal challenges; and need to look beyond technology developments at scientific research and at socio-economic factors in a holistic fashion. The eGovRTD2020 roadmap proposes research themes and actions in order to advance eGovernment research in the next future. The result is a strategic research program for eGovernment.

The eGovRTD2020 overall roadmapping approach embarks on existing roadmapping methodologies as introduced above. Yet, it innovates, argues and evidences the roadmapping results by examining the current state of play in eGovernment research; by embarking on visionary scenarios for governments interacting with its constituency via ICT in an effective and efficient way in the intended future of 2020; and by assessing current research against the needs of future scenarios in terms of analyzing gaps of current research. In [3], a comprehensive description of the overall project results is provided. The underlying rationale was to identify the necessary transition steps to reach the visions of eGovernment in 2020, involving research, development and implementation. This was driven by the goal of

the project to support the implementation of the vision of the European Community: to transform the European government landscape into a coherent community anticipating customer needs and making use of the available potentials of innovative ICT (cf. Lisbon strategy¹ and i2010 [7]). With the identification and recommendation of key eGovernment research in the next future, the roadmapping results shall contribute to the development of eGovernment research.

3.1 Specific eGovRTD2020 Roadmapping Methodology

To better identify the needed research themes and internal implementation models for effectively addressing and resolving research gaps in eGovernment, a comprehensive iterative roadmapping methodology was designed as shown in Fig. 1. It comprised:

- Several sets of regional roadmapping workshops to interact with experts from governments, ICT industry and consulting, and academia in order to identify the key future research themes of the field. To reach out widely, an online consultation was implemented, too. An internal validation workshop was performed to aggregate, validate and consolidate the results from the regional workshops and the online consultation.
- A high-level policy workshop to test and validate the condensed results with experts.
- An online survey to assess the importance of the proposed research themes.

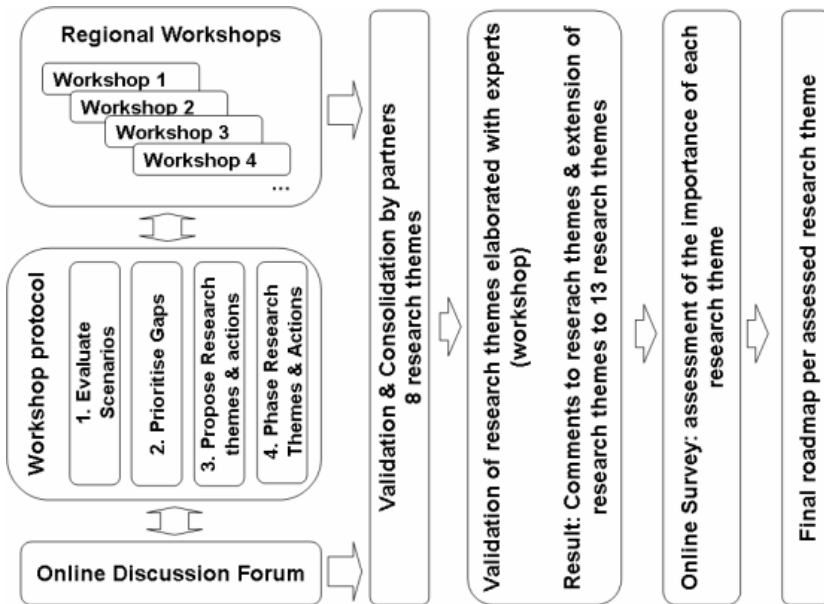


Fig. 1. eGovRTD2020 iterative policy-oriented science & technology roadmapping

¹ Lisbon Strategy, 2000, see: http://europa.eu.int/growthandjobs/index_en.htm

The protocol for the regional workshops and the online consultation consisted of the following steps:

- *Assess and comment the final eight scenarios.* The aim of this step was to validate the descriptions and comprehensiveness of the final eight scenarios developed in eGovRTD2020 (cf. [2]) by the experts in order to convey the most important aspects of potential futures of government activities in 2020.
- *Assess and prioritize the identified gaps.* The participants were asked to assess the identified gaps in order to confirm validity of the assessment of highly relevant and important gaps performed by the project partners in the gap analysis (cf. [16][17]).
- *Identify, develop and extend research themes and actions.* Experts were grouped along their professional engagement and competence profiles, and they were asked to formulate important themes for future research in eGovernment in a specific thematic area. For the most important research themes, research actions and means of implementing the actions were formulated for target stakeholders.
- *Phase the proposed research themes and actions.* The proposed research actions were phased into a time scale of short-term (2006-2010), medium term (2011-2015) and long term (2016-2020) implementation.

The workshops were carried out in a time-span of four months from October 2006 till January 2007. Since the results gathered per workshop improved the validity of former results, an evolutionary approach was used to conduct the series of regional roadmapping workshops. Consequently with the experience and feedback gained from each workshop, the materials and approach for the next rounds of roadmapping workshops were updated. In the workshops, experts from governments, ICT industry and consulting, as well as from politics, and researchers were participating.

Based on the inputs of the regional workshops, the project consortium synthesized the results and extracted a final set of research themes, actions and measures to implement the research by specific actors in a certain time-span. These results were documented through three specific elements:

- A description of the research theme including key research questions and a few keywords;
- A detailed description of the research actions, means of action and key actors; and
- A roadmap chart indicating the research themes and actions in a time-scale.

3.2 Overall Results

Before exemplifying the methodology with the research theme “Ontologies and intelligent information and knowledge management”, some overall facts on the roadmapping exercise are shown in Table 2. Eleven workshops and an online consultation were performed. In total, 340 participants (thereof 232 individuals in the regional roadmapping workshops) contributed with their expertise to the regional workshops and the online consultation (see Table 2). Experts were contacted by partners via invitation. The workshop organizers had to achieve a good balance of representatives from the key actor groups, and of distinct professional backgrounds.

The inputs gathered in the regional workshops and through the online consultation are documented in ([3], pp. 127-161). Thirteen research themes were extracted:

Table 2. Number of participants per expert group in the regional roadmapping workshops and the online consultation

	Country where the regional workshops took place										Online	Total	
	AT	ES	IT	DE	NL	LT	SI	FR	US	BE			AU
Government & Politicians	6	3	8	1	5	7	4	3		14	6	14	71
IT Industry and Consulting	5	12	1	8	7	6	8	2		14	10	19	92
Academia	5	13	4	9	5	6	6	7	20	15	12	75	177
Total	16	28	13	18	17	19	18	12	20	43	28	108	340

- Trust in eGovernment
- Semantic and cultural interoperability of public services
- Information quality
- Assessing the value of government ICT investments
- eParticipation, citizen engagement and democratic processes
- Mission-oriented goals and performance management
- Cyber infrastructures for eGovernment
- Ontologies and intelligent information and knowledge management
- Governance of public-private-civic sector relationships
- Government’s role in the virtual world
- Crossing borders and the need for governance capabilities
- eGovernment in the context of socio-demographic change
- Data privacy and personal identity.

In a final online survey, these research themes were assessed in terms of importance by a number of experts coming from around the globe. 380 individuals participated in the online survey, of which 88 experts came from governments, 57 from ICT industry and consulting and 233 from academia. In terms of geographical distribution, 72% of participants were from Europe, 17% from America, 6% from Australia, 3% from Asia, 1% from Africa, and 1% did not indicate the location. The invitation of experts to participate in the online survey was spread through targeted mailing lists and personal contacts of partners to respective key representative experts. Readers are referred to [3] to gather more insights on the assessment of importance of the themes.

3.3 Exemplifying the Roadmapping Methodology: Roadmap for the Research Theme “Ontologies and Intelligent Information and Knowledge Management”

Abstract: Governments are currently struggling with huge information overloads, with new and emerging ICT capabilities, and with a shortage of information management skills and human expertise. Ontologies and knowledge management facilities (such as search, retrieval, visualization, text mining, and intelligent reasoning) seem promising but need to be exploited more effectively to achieve information quality and economy, and to support knowledge management processes in eGovernment settings.

Key research questions:

- How can ontologies and knowledge management facilities (such as search, retrieval, visualization, text mining, and intelligent reasoning) be exploited to achieve information quality and economy, and to support knowledge management processes in eGovernment settings?
- How to extract and retrieve information and valuable knowledge, as well as mining data and text from unstructured and dispersed knowledge bases and information sources in government contexts? What technologies to use, what organizational, political and legal conditions have to be settled? What is the economic and what the public value?
- How to visualize knowledge and create cognitive knowledge models accessible for all, as well as intelligent interfaces for all?
- How to build a foundation of common reference models (ontology) for eGovernment and eParticipation?
- How do advanced information and knowledge management tools and concepts in eGovernment impact governments, market and society as well as information quality and information economy in respect to government activity?

Keywords: Information and knowledge management, intelligent reasoning, ontologies.

The actions proposed to implement the theme in a certain timeframe, and the actors that should implement them are described in an action table as shown in Table 3. The respective phased roadmap plan is shown in Fig. 2.

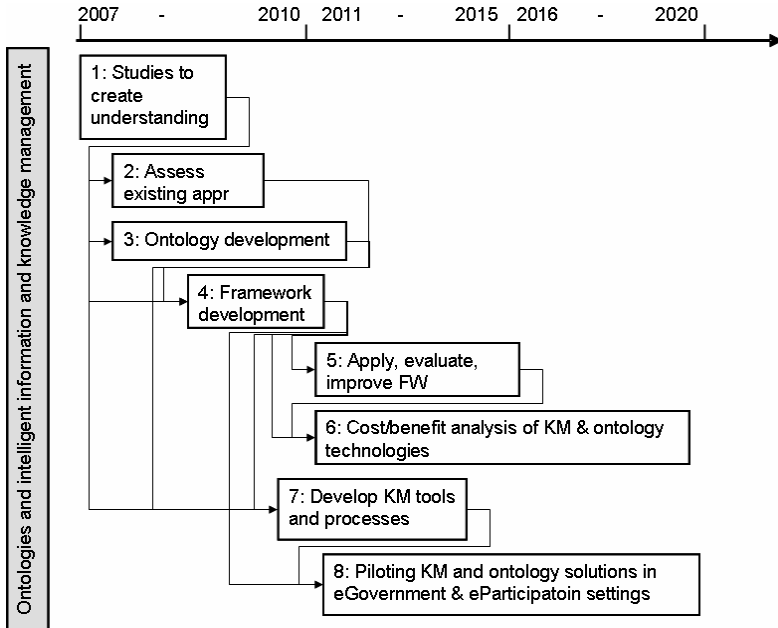


Fig. 2. Phased actions for the research theme “Ontologies and intelligent information and knowledge management”

Table 3. Actions, means of actions, and actors for the research theme “Ontologies and intelligent information and knowledge management”

Description	Means	Actors
<p>Studies to investigate a proper understanding of ontology and knowledge management (OKM) in government contexts, including:</p> <ul style="list-style-type: none"> Which stakeholders need which kind of knowledge in which contexts? Which solutions are already in use? What barriers do hinder proper KM introduction in government contexts? What are the benefits of KM in the various eGovernment contexts, and benefit for whom? What tools are needed for effective knowledge management in government settings? Taxonomy / ontology of eGovernment knowledge Criteria to assess the value of knowledge Drivers to introduce KM in eGovernment contexts 	<p>Action research, comparative analysis, desk research, conceptual design, theory development</p>	<p>Research with key players from governments and ICT industry</p>
<p>Measuring existing approaches of KM, and testing them in government settings in respect to the key aspects and added value of KM and ontology</p>	<p>Gap analysis, action research, pilot projects</p>	<p>Research with governments & ICT industry</p>
<p>Develop a framework and criteria for measuring the added value of KM and ontologies and the impact on information quality and economy, as well as on efficiency and effectiveness of government activity</p>	<p>Conceptual design and user participation, action research</p>	<p>Research (and consulting) with governments (and customer r.)</p>
<p>Apply, evaluate and improve the framework</p> <ul style="list-style-type: none"> Pilot cases Reengineering of framework Benchmarking at micro-level Benchmarking across countries (macro-level) 	<p>Pilot projects, reengineering conceptual d,</p>	<p>Consulting and governments, with support of</p>
<p>Analysis of costs / benefits of KM and ontology usage</p> <ul style="list-style-type: none"> What are the costs if no such instruments are introduced? What are the benefits of such instruments? What investments are needed for good ontology and KM exploitation? What are the consequences of good or of bad ontology and KM in government decision-making and electronic public services contexts? 	<p>Desk research, comparative analysis, impact analysis, action research,</p>	<p>Research and consulting with key players from governments and ICT industry</p>
<p>Develop a proper ontology for eGovernment and eDemocracy</p>	<p>Conceptual d., participatory d., action research</p>	<p>Research, governments, ICT industry& c.</p>
<p>Development of knowledge management tools and processes to be integrated in government activity</p>	<p>Requirements analysis, conceptual d.</p>	<p>ICT industry, research & governments</p>
<p>Piloting knowledge management solutions in eGovernment settings</p>	<p>Pilots, Case studies</p>	<p>ICT indust. & c, governments, and research</p>

4 Concluding Reflections

In the last years, many EU Member States have revised their existing strategies for public sector modernization and transformation of eGovernment, and they have adapted them to meet the objectives of the EU strategies such as i2010 and the Lisbon agenda. In most cases, these strategies and activities are short to mid-term oriented.

With this contribution, a broad community shall be activated and stimulated to debate and underline the need for eGovernment research and to explore new ways of working together in the field of eGovernment until 2020. The eGovernment research roadmap provides a baseline of argumentation for strategic decision-makers in government, politics, and the ICT industry and consulting to direct research efforts towards important new challenges. The research roadmap details thirteen research themes that need to be addressed in future research in order to meet the requirements of the coming future, in particular to realize the vision of an Information Society supported by innovative and modern governments.

The eGovRTD2020 project results offer several future visions and concrete eGovernment research actions linked to advanced solutions in this field. Likewise, emerging problems and trends such as socio-demographic change; natural, economic, and virtual crises; trust in Government; participation across public, private, and civic sectors; innovation and modernization; and virtual world orders are being discussed. Lines of argumentation are provided to support decision-making for streamlining certain futures and developments. These arguments should help to build a baseline for the next calls of the 7th Framework Program of the European Commission to bring back eGovernment as a key research theme and high priority towards realizing the EC strategic policy goals. They also provide a guide for national research programs to support innovative RTD for public sector responsibilities and to spur innovation emerging from within the public sector in order to contribute to a highly innovative knowledge society across Europe and worldwide.

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Towards a Cumulative Tradition in E-Government Research: Going Beyond the Gs and Cs

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Abstract. The emerging research area of e-Government is gradually moving towards a level of maturity on the back of increasingly rigorous empirical research. Yet, there has been little theoretical progress and a cumulative tradition is not emerging. We argue that a principle reason for this is a lack of shared understanding about basic concepts and entities amongst scholars in the field. Specifically, the entities that form the bedrock of e-Government research, such as “Government” and “Citizen” are conceptualized at a very general level of abstractions and treated as homogenous groups. We argue that existing models and frameworks fail to see the vast differences that exist between categories of these entities. Without a finer grained conceptualization, comparison of findings across different research studies is not possible and thus transfer of knowledge between different projects is difficult. This is a fundamental obstacle in developing a cumulative tradition. Based on an examination of the literature, we propose categories of “Government” and “Citizen” at a finer grain and discuss implications for both practice and research that stems from our conceptualization.

Keywords: e-Government concepts, government, citizen, cumulative tradition.

1 Introduction

E-Government as an area of research and practice has been around for roughly a decade and a half (and IT in public sector for some 50 years). Recent reflections based on rigorous examinations of the intellectual development of the field has revealed that the field is gradually maturing [1-3]. The knowledge base of the field is growing at a fast rate fuelled by an accelerated increase in the number of papers published in refereed outlets [3]. More importantly, the quality of research is steadily improving. There is more empirical research [1, 2], employing rigorous methods spanning the full spectrum of methods [1, 3], and is becoming multi-disciplinary in nature [3]. Rigorous research has also reduced the incidence of “dubious claims” [1]. These are optimistic trends and it gives the impression of a dynamic maturing field with a dedicated and enthusiastic group of scholars.

Yet, there are ominous signs. e-Government remains under-theorized [3] and there are few attempts at either theory testing or theory building [1]. While the relatively high interaction with practice can be the envy of related fields such as Information

Systems, it may well be a weakness. Gronlund and Anderson [1] found that almost 30% of the papers they reviewed were product descriptions. One reason for this may be the funding policies of the EU that encourages product development and service delivery [4].

The lack of theoretical endeavours reduces our ability to analyze and understand current e-Government developments. No wonder Scholl [3] found a lack of shared vision of the impact of e-Government initiatives. Research has shown limited crossreferencing and hardly any cumulative studies [2].

Thus, e-Government research is in serious danger of becoming a fragmented field populated with a series of one-shot studies, albeit rigorous, but little progress towards a coherent area with its own theories. To do so, it is essential to build a cumulative tradition which is characterised by the following [5]:

- Researchers build on each other's and their own previous work
- Definitions, topics and concepts are shared
- Senior researchers view their main role as shaping the field
- Each journal in the field has a clear focus
- There is some definition of orthodoxy, while unorthodoxy is not discouraged (p. 13).

Reviews cited earlier (e.g., [1, 3]) reveal that the last three characteristics are present in e-Government research. Missing are the first two points which both cause and result in each other.

In this paper, we address the second issue: lack of the shared view about key concepts. The precursor to articulation of theories in any field is a consensus among researchers on concepts and definitions. We examine two key and fundamental entities of e-Government, namely, "Government" and "Citizen" and propose finer grained conceptualization of these entities. Based on an examination of the literature, we propose categories of these entities.

The rest of the paper is organized as follows: Section 2 outlines *Government* and *Citizen* as the fundamental entities of e-Government and argues that these categories of entities are too broad in order to provide a meaningful conceptual basis for understanding e-Government and to develop normative guidelines for the further development of the field. To address these issues, Section 2 re-conceptualizes *Government* and *Citizen* into more fine grained categories that are considered to provide a higher descriptive accuracy than existing conceptualizations. Section 3 illustrates the proposed entities resulting from the literature review in Section 2 and suggests possible interactions between the entities. Further, Section 3 discusses the implications this new conceptualization has for both research and practice. Finally, Section 4 makes some overall conclusions from the paper.

2 Theoretical Conceptualizations

Arguably, "Government" and "Citizen" are the most fundamental entities in e-Government research. Yet, these terms are taken almost for granted and there is hardly any scholarly examination of what they mean. In the absence of theories, this

is not surprising. However, existing theoretical expositions offer some possible avenues. One such direction is provided by the framework proposed by Grönlund [6] which distinguishes three “spheres of governance” (p: 7), namely formal politics, administration and civil society. Although not explicitly stated, it can be reasonably argued that the term “Government” as used in the literature includes formal politics and administration. The term “Citizen” is exhumed in the remaining sphere, i.e., civil society.

This model is useful in distinguishing the types of interaction between key entities. However, it depicts a very high level conceptualization that stands the risk of oversimplifying the complexity of governance. Each sphere, or stakeholder group, contains a variety of stakeholder interests and different modes of operation, and it is clearly impossible to view any of the basic stakeholder groups as unified entities promoting just one or a few common interests. For example, politicians set policy on, among other things, providing services to citizens while civil servants such as administrators execute them. A large part of the citizenry simply consumes these services but a significant minority actively attempts to influence policy. This leads to different objectives of communicating within and between these groups. It is on this premise that we propose categories of these entities.

2.1 Reconceptualizing “Government”

Government entities are often classified according to hierarchical position in a multitier structure. Typically, such structures involves a national central governing organ (the central government), a regional level (e.g. the County) and a local level (city or municipality) [7, 8]. The tier-distinction can be a purposeful one as the different tiers perform different and separate tasks that in total represent the spectre of services available to society. However, practical government service production often requires interaction between tiers and also within tiers (but across different entities). This internal interaction, where data needs to flow between entities, is often referred to as horizontal or vertical integration in the e-Government literature [9]. The tierdistinction can be useful to visualize this interaction, but is insufficient as a means of understanding the complex challenges associated with actually making such integration happen. To sharpen our understanding of governments, we propose a further classification of the internal aspects of e-Government.

Although slightly dependent on hierarchical position, government entities can easily be further separated in three distinct groups, namely administrations, service providers and politicians. With such a categorization, administrations represent management and coordination functions of government agencies. The public administration literature often refers to government agencies as typical bureaucratic structures entailing a fascination for management and control [10]. While a bureaucratic tradition certainly exists in government agencies, we argue that such entities are more faceted than this rather stereotype description allows us to understand and that the preoccupation with management and control only reflects the description of what we refer to as *Administrators*. A typical example of this category would be Chief Administration Officer of a municipality and this person’s staff. The primary concern of this group is to govern it’s agency according to directions provided by other agencies such as county and central governments and to ensure that

the operations of the agency is maintained within budget and according to rules and regulations. Much of the e-Government literature has focused on the interests of the Administrators by discussing the potential of e-Government to provide better control and coordination and increased cost efficiency [10-12]. While the administrative element of government entities certainly constitutes an important aspect of e-Government, this aspect fails to encompass other, equally important aspects like facilitating citizen centric modes of governance and increased democratic participation [13]. Therefore, we propose to distinguish between *Administrators* and *Service providers*, allowing a more nuanced conceptualization of government entities.

Service providers represent a different entity with a somewhat different purpose from the *Administrators*. This group represents an agency's interface toward civil society with the purpose to ensure that public services are supplied as specified by administrations and politicians. However, the close and constant interaction with the service consumers places this group in a somewhat different position from administrators. The service providers are thus more likely to be concerned with the quality of the service they offer than being overly engaged in budgets and overall strategy of an agency. While there are several mentions of government employees as a distinct group within governments [7, 14, 15], viewing government entities in light of whether they have primarily administrative or service perspectives have not been extensively explored in the e-Government literature. However, the proposition that there does exist a segment within governments that differs from the mainstream understanding of governments as *administrators* has been suggested in a recent Norwegian study of benefits management practice [16]. Also, Griffin et. al. [17] and Peristeras et al [18] stress that (local) governments performs various roles, one of them being a service provider. This study does indicate that government employees occupied with service production and provision differ in their interests versus government employees that are predominantly occupied with more administrative duties. We therefore argue that the concept of *service provider* is more meaningful than *government employees* as employees as a category inevitably would represent both our proposed categories of *administrators* and *service providers*.

Both administrators and service providers execute policies that are set by *politicians*. The central tenet in politics is the ability to shape society based on a particular notion of an ideal (and just) society [19]. The shaping of society is largely done by controlling government spending, i.e. allocating budgets to promote particular directions on societal development. Public spending can be given further directions through the development of policy and guidelines that administrations are instructed, or inspired, to carry out. Additionally, politicians may shape society through laws and regulations [19].

2.2 Reconceptualizing “Citizen”

Citizens comprise a major stakeholder group in the e-Government literature including work related to eDemocracy and eParticipation (e.g. [20-22]). Citizens are often discussed in relation to other stakeholder groups. For example, the relationship between citizens and politicians focus on the interaction between the two groups ([13, 23]), on how participation varies between these stakeholder groups [24] and on their specific roles [23].

In these discussions citizens are often seen as a homogenous group. An exception is Wimmer's model [25]. We agree and argue that citizens are a heterogeneous group with different interests and views on how they can utilize government services and influence and take part in public decision making processes. Their different relationships and roles influence on how these should be addressed when new e-Government services are to be implemented. We suggest that citizens can be divided into the three distinct groups; *consumers*, *activists* and *direct decision makers*.

Consumers are more interested in the product and the services offered by the government than the political process leading to these offerings [26]. Their concern is the quality of such services, and may not be influencing the decision making [27-29]. The role of such consumers in the decision making process is often limited to choosing between candidates in elections [26], thus supporting or rejecting the current political regime.

A large proportion of current e-Government projects reflects a consumer perspective on citizen participation.. Even where citizens ostensibly have the opportunity to influence the decision-making process and policy, such as discussion forums for political debate, the authorities define the purpose for the communication beforehand and control the debate [29]. The use of such discussion forums are often connected to elections and used to inform and be informed by electors. The power balance between different stakeholders in the decision making processes are not challenged [29].

This "traditional" view of citizens as consumers differs markedly from the citizen as activist view. *Activist* citizens seek to be more explicitly and directly connected to decision making processes [19, 30] and emphasize the role of open discussions in a well functioning public sphere [31]. Politicians and citizens share an interest in dialogue and discourse leading to the formation of political opinion. Activists not only try to influence through traditional channels or solely through elected representatives, but they also seek to obtain visibility for alternative political expressions and criticism without interference from the political elite [32-34]. They seek to influence the political process [35-38] by using technological means to promote their interests such as public discussion forums [29]. Activists seek a much more interactive and interwoven role between themselves and other stakeholder groups taking part in the decision making processes (e.g., politicians and administration). They even contribute to setting the political agenda.

While activists attempt to influence the decision making, they do not actually make decisions, in contrast to a direct democracy system where citizens actually make the decisions [29, 39]. We refer to this group as *decision makers*.

Direct (cyber) democracy has been suggested as an ideal form of e-Democracy by some scholars [28, 40, 41]. Despite optimistic theorizing, the actual implementations of direct e-Democracy has remained rare [42-45]. Thus, the idea of citizens as direct decision makers has currently more academic than practical interests. Citizens are now seen to have both interests and wisdom to rule, and representatives are "generally regarded as a necessary evil that could and should be avoided in different ways" [26].

There are some examples of discussion forums that support citizens as direct decision makers [29]. These forums represent a direct channel to raise issues and affect decisions. The citizens are online affecting the decisions to be made (mostly at the local level). Citizens set the agenda both for public discussion and decisionmaking [29].

e-Government services based on a direct decision maker-view of citizens would be radically different than those e-Government services directed towards other categories of citizenry. ICT plays a critical role in implementations where the Internet no longer represents a supplement to traditional communication channels, but instead a crucial precondition for democracy [28]. A direct E-Democracy initiative requires communication technology to support coordination among a great number of decision-makers, i.e. citizens, possibly geographically scattered, with diverse interests and backgrounds.

3 Discussion

The primary contribution of our paper is a finer grained conceptualization of two fundamental entities of e-Government: *Government* and *Citizen*. Table 1 summarizes our conceptualization.

Table 1. Entities of e-Government

Basic entity	Sub-categories	Description	Source
Government (G)	Politician (GP)	Publicly elected decision and policy maker (e.g. mayor, councillor, parliament member)	[46]
	Administrator (GA)	Middle and higher level salaried career employees executing politicians’ policies (city manager, health department head)	[14]
	Service provider (GS)	Lower level salaried career employees carrying out day to day government jobs directly or indirectly interacting with citizens (e.g., case officers in school department, advisors and information providers in taxation office)	[16, 17]
Citizen (C)	Consumer (CCon)	Uses services offered by the government	[26, 28, 47]
	Activist (CAct)	Citizens involved in efforts to effect specific government policies and decisions through civil action often individually or in groups (e.g., Amnesty International)	[19, 26, 29]
	Direct Decision makers (CDD)	Citizens are directly responsible for the decisions being made in a direct democracy system.	[28, 29]

The subcategories allow us to look at more specific interactions between the entities. Table 2 summarizes these interactions.

Table 2. Interactions between the entities of e-Government

Type	Interaction	Example
Within entities	Politician – Administrator GP2GA	Politicians discuss policy issues and convey decisions to city employees
	Administrator – Service provider GA2GS	Strategic, tactical and operational decision making and task accomplishment

Table 2. (continued)

	Politician - Service provider GP2GS	Only informal
	Service provider – service provider GS2GS	Handing cases from citizens that cross departmental boundaries (e.g., placing a child through school)
	Administrator – Administrator GA2GA	Deliberations and decision making on issues that require involvement of more than one department
	All C2C interactions	Discussions on projects. Discussions on social issues
	All B2B interactions	Discussions on implications and consequences of government decisions
Between entities	Politician – all Citizen categories	Deliberations on social and governing issues and projects (such as a new road)
	Administrator – Consumers GA2Ccon And Administrator – Advocacy groups (CAg)	Information on forthcoming initiatives or explanations of decisions already made
	Service provider – Consumer GS2Ccon	Use of government services

This conceptualization has important implications for both research and practice.

3.1 Implications for Practice

By clarifying further the key concepts of Government and Citizen, our framework can eventually contribute to the practice of E-Government, especially in developing e-Government systems. Determining requirements for specific systems is not easy [29]. One approach that has been used successfully is genre-based where the communicative genres between entities are analyzed to determine requirements. We propose that subcategories of an entity have different genres of communication with another entity. Our framework can help designers to be more specific about these genres. The subcategories are also different categories of stakeholders with different powers, urgency and legitimacy.

3.2 Implications for Research

In our conceptualization of e-Government, we limited our analysis to two high level entities, namely Government and Citizen. A third stakeholder group that is important in e-Government, Businesses, is left out of our analysis, largely because this entity only has received marginal attention so far and we consider it therefore somewhat premature to theorize around it. Still, when reflecting on the Businesses at least two possible categories spring to mind: “individual businesses” and “business associations” (such as chamber of commerce and industry associations. We do, however, leave conceptualization of Businesses to future research.

Even the three categories of Citizen we propose leave out other important stakeholders. For example, we conceptualize “activists” as individual citizens.

However, an important part of civil society is groups of such individuals collectively known as “advocacy groups”. These groups have longer life span and often centred around causes that are more sustained. Examples are Amnesty International and Human Rights Watch. These groups are often subsumed under “NGO”. However, they are different from NGOs that focus on providing specific services – such as BRAC the Bangladesh-based NGO that aims at rural development. This is a fruitful avenue for future research.

4 Conclusion

We argued that despite advances in both quantity and quality of research in e-Government, there is little evidence of building a cumulative tradition. We believe that the main reason is a lack of shared meaning and understanding on primary and basic concepts in the field, specifically entities such as Government and Citizen. We delved into these entities and proposed categories of these entities. Like any new conceptual framework, our proposed re-conceptualization seeks to provide a clearer understanding of a phenomenon based on logically integrating prior work in the area. The academic community will find our concepts useful to compare findings across studies and re-interpret prior findings. For a field to mature, possibly to become a discipline, theory building is essential. (for a good discussion on the “disciplinarity” of e-Government see Scholl [3]). The first step to articulating theory, as Eom [48] points out is consensus building among the scholars of the field about concepts and definitions. Our paper is a step towards such consensus building.

Obviously there is a need to validate our concepts. Our conceptualizations are by no means complete or even comprehensive. It is a work in progress, and its usefulness lies in serving as a springboard for further work towards achieving conceptual clarity and developing a cumulative tradition in e-Government research.

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Innovation Processes in the Public Sector – New Vistas for an Interdisciplinary Perspective on E-Government Research?

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Abstract. Public sector innovations have been comprehensively studied from a managerial (New Public Management, NPM) as well as technological (Electronic Government, eGovernment) perspective. Here, much research work took a single-organisational managerial stance while little was investigated into corresponding public-sectoral innovation and diffusion processes. At this point, a political science view understands the embeddedness of public-sectoral innovation processes in the surrounding politico-administrative system. Therefore, we seek to investigate into public sector innovations in terms of identifying politico-administrative system dynamics which shape the process of their emergence and diffusion. In order provide empirical evidence, we analyse the Japanese case by the means of a series of qualitative-empirical expert interviews. We demonstrate how decentralisation reforms open up innovation potential for local governments, by which means the central government still holds strong influence on innovation and diffusion processes, and which possible paths of eGovernment and NPM innovation manifest as a result.

Keywords: Interdisciplinary research, public sector, innovation, Japan, electronic government, administrative reform.

1 Introduction

The international conference on Electronic Government EGOV 2006 provided us with a fruitful discussion on trends, issues, and challenges of contemporary research in our field [1]. Here, for instance Sannarnes, Henriksen, and Andersen [2] posed the question if eGovernment research was lacking New Public Management (NPM) [3] and innovation flavour. The public sector – as the major field of our investigations – provides a deeply specific setting, a setting that is heavily shaped by nationally and also regionally different politico-administrative systems [4]. Such systems have been productively studied by many academic disciplines, among them public administration or political science [5, 6]. This work not only provides us with fruitful findings for our technology-oriented studies, it also strongly calls for an integrated and interdisciplinary perspective on studying public sector phenomena, such as in the focal point of our research, eGovernment. Following the arguments of last year's discussion, we can identify the need for targeted, integrated interdisciplinary studies.

In times when budgetary and performance situations deteriorate and citizen expectations grow simultaneously public sector reforms head the political and administrative agenda. eGovernment managers – on an individual-organisational as well as, for instance, on a national level – have great interest in managerial and technical innovations that seek to improve the effectiveness or efficiency or public service delivery. Here, eGovernment research already provided fruitful and feasible solutions in terms of socio-technical innovations [7, 8], but rather falls short when it comes to taking into account a meta-organisational perspective on the politico-administrative system. On the other hand, political science research takes such perspective and analyses various policy fields, including social or environment policies and information disclosure acts [9, 10]. However, such research did not yet provide a comprehensive body of knowledge in innovation and diffusion processes of public sector Information Technology (IT). As information systems (IS) research has proven, analysing IT innovation and diffusion processes often necessitates a broad technological knowledge as well [11, 12]. As a result, various academic disciplines productively contributed to analysing innovations and their diffusion processes in the public sector from specific perspectives. Nonetheless, an integrated and interdisciplinary analysis of (1) IT-related (2) innovation and diffusion processes (3) in the public sector politico-administrative system is not yet to be found to a necessary extend. Therefore, we seek to address the question of eGovernment and NPM innovation and diffusion processes in the public sector. At this juncture, we take a stance that draws from several relevant academic disciplines. First, our research question spans both technology- and management-oriented innovations in terms of eGovernment and NPM; innovation streams which habitually correlate in public sector practice. Second, we embed our study in a broader investigation of the surrounding politico-administrative system. Here, we heavily draw from political science research in order to investigate into the policy field of public sector IT. In order to substantiate our analysis, the case of Japan is selected as first example and will be approached by the means of an extensive literature review and a comprehensive series of qualitative-empirical expert interviews conducted in Japanese public organisations. The Japanese case is specifically interesting as the politico-administrative system is characterised by recent and intensive reform efforts, especially central-local decentralisation approaches. Such high-impact dynamics will potentially shed new light on eGovernment and NPM innovation and diffusion processes [5, 6].

The following section contains an analysis of related work and its disciplinary perspectives. Subsequently, we present a brief methodological discussion and our research framework. This framework is used to structure the analysis of the Japanese politico-administrative and its public-sectoral innovation and diffusion processes. Section 5 reveals general and generalisable issues on the basis of the Japanese study. The last section summarises our findings and discusses potentially fruitful future research.

2 Related Work

eGovernment (e.g., Open Source Software, Business Intelligence, Content Management Systems) and NPM innovations (e.g., Public Private Partnerships, outsourcing,

Management by Objective, performance-based salary systems) have already been addresses by various previous research. Here, four major stances can be differentiated from one another, on the one hand with regard the object of analysis (innovation result-oriented vs. innovation process-oriented), on the other hand regarding the extent of the study (single-organisational vs. multi-organisational/sectoral):

- 1) Regarding single-organisational studies, eGovernment research has produced various fruitful and feasible solutions in terms of socio-technical innovations [1, 8]. Of course, such approaches bear relevance transcending an individual research setting, however, they are mainly designed to answer managerial and technological problems from a single-organisational stance. Such questions might include, for instance, which specific IT to introduce [13, 14], how to design business processes [15], how to innovate managerial processes [16], or which innovative hardware-oriented concept to apply [17].
- 2) Studies tackling single-organisational settings from a process-oriented perspective have been widely conducted in the field of information systems research. Such approaches often draw from the general Diffusion of Innovation Theory that identifies five categories of individual innovativeness, from innovators, over early adopters, early majorities and late majorities to laggards [18]. Moreover, for instance, Bradford and Cooper [19] analyse the ERP implementation success in organisational settings and include innovative characteristics (e.g. complexity), organizational characteristics (e.g. top management support), and environmental characteristics (e.g. competitive pressure) as factor that explain individual-organisational innovation, or better “infusion”.
- 3) Multi-organisational or (public) sectoral studies often inform political decision makers, for instance, reporting eGovernment or NPM adoption ratios. Such studies might address, for instance, cooperative eGovernment or NPM projects, eReadiness [20], certain technology-specific usage and adoption [7, 21], or country-specific reports on public information systems usage, e.g. the Japanese case [22].
- 4) Multi-organisational or sectoral issue have been addressed by various general public sector studies. Investigations went into, for instance, the area of social, environment, or information disclosure policies [9, 10]. However, political science research does not yet provide a comprehensive body of knowledge in innovation and diffusion processes of public sector IT [23].

At this juncture, we take the stance that eGovernment and NPM innovations support a more effective and/or efficient public service delivery. Our study will transcend a single-organisational perspective (see 1 and 2) in order to investigate into how politico-administrative circumstances shape public-sectoral diffusion of such innovations (see 4). While policy diffusion research has shown that innovation and diffusion processes in the public sector heavily depend on the specific policy field [9], we seek to contribute in terms of providing a specific study on eGovernment and NPM innovation and diffusion processes. With regard to the presented Japanese case (Section 4), we also seek to complement country-specific investigations [22, 24, 25].

3 Research Methodology

3.1 Literature Analysis and Research Framework

Prior to the series of expert interviews, an extensive literature review was conducted. Main fields included (comparative) studies of public sector reform, comprising eGovernment and NPM approaches, organisational innovation studies, political science-oriented innovation and diffusion studies as well as adoption studies in the public sector (see also Section 2). Here, we sought to identify relevant circumstantial dimensions which acknowledge the embeddedness of eGovernment and NPM innovation and diffusion processes in the politico-administrative systems. Here, Pollitt and Bouckaert [6] provide a comprehensive and detailed framework for understanding public sector reforms in their specific national context. Major dimensions of analysis comprise a) external influences to the politico-administrative system, e.g. change events, b) political system characteristics, e.g. party system, c) administrative system characteristics, e.g. federal or unitary structure, and d) system dynamics (see Tab. 1). These dimensions will guide our further analysis in terms of expert interviews.

Table 1. Major Circumstantial Dimensions to Public Sector Innovation and Diffusion [6]

Dimension	Description
a) External factors to the politico-administrative system	<ul style="list-style-type: none"> ▪ External factors often influence politico-administrative systems and initiate system internal dynamics and changes. Such external factors include change events, such as elections and scandals, but also broader socio-economical developments, such as aging populations or economic recessions. Moreover, general modernisation policies, such as NPM or eGovernment can be considered to have an external influence.
b) Political system characteristics	<ul style="list-style-type: none"> ▪ A political system may be shaped, for instance, by its party system, political actors, or lobbies.
c) Administrative system characteristic	<ul style="list-style-type: none"> ▪ An administrative system consists of, for instance, its inner structure (federal or unitary), administrative decision-making characteristics, or administrative culture.
d) System dynamics	<ul style="list-style-type: none"> ▪ (Politico-administrative) system dynamics often trigger changes in public sector innovation and diffusion processes. This might be the case, if decision-making competencies (with regard to eGovernment and NPM innovations) are shifted from one to another entity. At this point, public sector reform approaches, such as eGovernment and NPM, reveal a duality. On the one hand, they represent specific policies; on the other hand, they reshape the politico-administrative system itself. Consequently, public sector innovations influence the context for their own emergence and diffusion. Here, the analysis of system dynamics addresses those reform approaches which have impact on the politico-administrative system.

3.2 Expert Interviews – Methodology

Against this background, a series of 10 expert interviews was conducted within a 3 months-timeframe. The problem-centred interviews have been literally transcribed and analysed by the means of a coding-based qualitative content analysis (using Atlas.TI software). Local

government (4) as well as central government/ ministerial experts (6) were interviewed while 6 out of those 10 held positions of department heads or division deputy directors. The series of interviews was carried out against the background of an interpretivist-epistemological assumption [26, 27]. Such stance appreciates the subjective and organisational embeddedness of interview statements and, in a critical view, acknowledges that such statements do have political dimensions. As a consequence, special attention was paid to the relationship of the interview content and the history and current position of the expert interviewed.

4 Case Study Japan

4.1 Public Sector Reform Dynamics

Japan is regarded as a late adopter of NPM-oriented approaches while, however, societal and economical challenges (see Tab. 2, a) have triggered major reform efforts since the late 1990s [28]. Furthermore, after nearly 50 years of LDP-prime ministers being in office, oppositional parties gained power from 1993 to 1996 and intensified the reform discussion, for instance, regarding decentralisation (see Tab 2., b).

Table 2. Major Circumstantial Dimensions to Public Sector Innovation and Diffusion in Japan

Dimension	Description
a) External factors to the politico-administrative system	<ul style="list-style-type: none"> ▪ Economical challenges, also as a consequence of the burst of the Japanese “Bubble Economy” in the early 1990s [32]. ▪ ”Aging Society” phenomenon hand in hand with a decline of the population [33] ▪ A series of corruption scandals among high officials lead to a decrease of trust in the Japanese government ▪ Lack of (local government) accountability (as a result of high government-internal financial transfers, e.g. Local Allocation Tax)
b) Political system characteristics	<ul style="list-style-type: none"> ▪ The Liberal Democratic Party (LDP) has strongly dominated the political landscape in Japan, having a LDP prime minister in office from 1955 to 1993 and from 1996 onwards. However, during Hosakawa (1993 to 1994) and the Murayama administration (1994 to 1996) several steps have been undertaken which shape today’s public sector reform in Japan, for instance, the decentralisation promotion program [34].
c) Administrative system characteristic	<ul style="list-style-type: none"> ▪ The Japanese administrative system consists of the central government and local governments. The latter is organised as a two-tier system consisting of prefectures and municipalities [34]. Japan can be considered as a unitary system where, in contrast to, for instance, German federal states, ‘local’ entities are not the state constituting elements. However, issues of local autonomy are covered by law.
d) System dynamics	<ul style="list-style-type: none"> ▪ Japanese reforms heavily emphasise decentralisation. Such efforts comprise, for instance, the decentralisation of functions as well as authority and responsibility or the fiscal “Trinity Reform” which shifts tax income from central to local entities [31].

While the Japanese politico-administrative system is a unitary system (see Tab. 2, c), strong emphasis of recent public sector reforms is put on decentralisation (see Tab. 2, d). These decentralisation efforts comprise agencification (here: “Incorporated Administrative

Agencies (IAA)” [29], meaning the founding of new organisational units (agencies) having a specified degree of managerial independence) as well as vertical decentralisation (meaning a central to local shift of authority). Niikawa [30] identifies two major streams of action underlying to such governance structure reform: (1) The first stream of action aims at strengthening and enabling local governments for larger governance tasks. Such reform efforts include, for instance, building up an operable unit size, here in terms of municipal mergers (1999: 3.229 Japanese municipalities, 2007: about 1.800). Furthermore, a variety of NPM and eGovernment reforms is performed in order to increase Japanese local government managerial efficiency and effectiveness. Examples of such NPM-oriented approaches are project and policy evaluation systems and strategic management while major eGovernment projects address Business Process Management, Open Source Software, and data standardisation issues. (2) Alongside with strengthening local governance capabilities, the central-local relationship is changed in terms of vertical decentralisation. Such decentralisation comprises the transfer of tasks and functions from central to local entities, but more and more also the transfer of genuine authority accompanied with a significant change of the fiscal system (“Trinity Reform”) [31].

The resulting decentralisation of decision-making and governance competencies (see Tab. 3, d) changes the basic outline for the emergence and diffusion of eGovernment and NPM innovations themselves. First, a growing accountability in local entities increases the motivation for local governmental reforms. Second, a greater financial independence fuels such decentralised local reform initiatives. Here, the question arises of how central and local actors make use of such new opportunities in terms of pursuing eGovernment and NPM innovations.

4.2 Expert Interviews – Results

The series of expert interviews aimed at identifying central and local government influence on public-sectoral eGovernment and NPM innovation and diffusion. Specifically, it is investigated into how decentralisation of governance opens up for a decentralisation of innovativeness. Here, several institutions have high impact on current streams of innovation and diffusion (see Tab. 3). Such institutions include mass media, educational institutions, local-horizontal cooperation, but also targeted central government measures, for instance, in terms of financial support, know-how transfer, and personnel exchange (‘amakudari’).

Here, a recently started central government measure is the distribution of comprehensive best-practice reports on innovative NPM as well as eGovernment projects. Both types of reports follow a similar schema: Central government requests prefectures and municipalities to report about their ongoing reform efforts. The resulting project descriptions are collected and constitute the basis for best-practices selection, a process which is performed by the central government Ministry of Internal Affairs and Communication (MIC). Subsequently, a best-practices case book is compiled and distributed among local entities on a nation-wide basis. Both types of reports have been introduced recently, the first NPM-oriented report (about 100 case descriptions) was issued in 2006, the first eGovernment-oriented report (about 40 cases) in January

Table 3. Institutions in public sector innovation and diffusion in Japan

Category	Main Institutions
Statutory-based measures (by Central Government (CG))	<ul style="list-style-type: none"> ▪ Central government requires local governments to develop a NPM-oriented “Intensive Reform Plan”. Here, certain categories of reform have to be covered, including, for instance, policy and administration evaluation or personnel management issues.
Personnel measures (by CG)	<ul style="list-style-type: none"> ▪ The Japan-specific “amakudari”-system allows for central government officials to temporarily work in local governments, habitually on the top management level
Know-How-oriented measures (by CG)	<ul style="list-style-type: none"> ▪ Best-practice NPM reports by the central government Ministry of Internal Affairs and Communication (MIC): nation-wide survey, best-practice identification, nation-wide distribution of a best-practices NPM case book, initiated 2005 ▪ Best-practices eGovernment reports by the MIC: nation-wide survey, best-practice identification, nation-wide distribution of a best-practices eGovernment case book, initiated 2006
Financial measures (by CG)	<ul style="list-style-type: none"> ▪ Financial incentives for local eGovernment projects that comply with central government requirements in terms of, for instance, free of cost Open Source Software or funds for joint IT outsourcing projects
Educational measures	<ul style="list-style-type: none"> ▪ Educational scholarships for (central and local) government officials, often Public Administration Studies in the US or at Japan-based graduate schools ▪ Education of local government officials in often central government-related educational institutions, for instance, Local Autonomy College (www.soumu.go.jp/jitidai), Japan Academy for Municipal Personnel (www.jamp.gr.jp), or Japan Intellectual Academy of Municipalities (www.jiam.jp)
Mass media	<ul style="list-style-type: none"> ▪ Public administration-specific mass media, for instance “Government Technology”, regularly provide information about best-practices in public sector reform and undertakes various ranking efforts. ▪ Most leading local government reform projects provide extensive information on their websites.
Local-horizotal relationships	<ul style="list-style-type: none"> ▪ Local-horizontal relationships include, for instance, institutional relationships such as working group collaborations, and personal contacts.
Private sector multipliers	<ul style="list-style-type: none"> ▪ Also consulting and IT companies seek to multiply their (proprietary) management or technology solutions. Thus, software, hardware, or consulting-driven innovation multiplication can be considered as an important factor.

2007. Remarkably, the two types of reports are accounted by two different divisions in the central MIC (the former by the Local Administration Division on NPM, the latter by the Division of e-Local Government).

Compared with the situation five years ago, the central ministry influence on local government innovation and diffusion processes diversified in its appearance. Here, traditional measures of taking influence, such as the personnel exchange system ‘amakudari’, are complemented by new measures, including, for instance, best-practice reports on NPM and eGovernment or financial support for local eGovernment projects that comply with central government requirements (see Tab. 3).

Some local governments, in that regard, afforded on own research department which closely watches reform-related activities by other governmental agencies, especially the central government:

The research section is not independent from other projects, it relates to the other reform subjects. A major way of researching is learning from other governments. This also means especially watching central government activities: What does the central government think about eGovernment and other public administration reforms. [translated]

Nevertheless, local government officials stated that they perceived significant changes in their eGovernment and NPM activities. A local administration NPM department head argued:

Only five years ago, local government just had to follow central government orders, but that situation has radically changed. We have to be independent in thinking about local government circumstances and about streamlining our own local governmental processes. [translated]

Local governments experience a growing responsibility when it comes to initiating and designing concrete NPM and eGovernment reform projects. With regard to the diffusion of innovations, a local government official stated:

We perceive that there is an increasing influence of local governments on public sector reform policies in Japan. Here, the central government acts as a promoter in order to spread local government best-practice ideas to other local governments. [translated]

Taking a reform example from the field of Public-Private-Partnership, a local government official described the central government influence as follows:

All local governments have to deal with Public-Private-Partnerships, e.g. in the area of facility management. But still, central government still preserves influence on local governments' facility management. This means that though facility management can be regarded as initially local government-driven (as a lot of local governments introduced NPM-oriented facility management approaches and privatised maintenance) central government now follows these efforts and made a law which is already enacted. [translated]

Consequently, we could identify a multitude of factors that influence NPM and eGovernment innovation and diffusion in Japan. Such factors include traditional as well as new measures undertaken by the central government, but also a growing trend towards local-horizontal cooperation and diffusion processes.

5 Discussion

Public sector reform in Japan, especially decentralisation, has significant impact on the governance structure. There is a growing trend towards strengthening local governance capabilities and shifting tasks, functions, authority, financial revenues, and responsibility from the central to the local government level. Such changes in the

governance structure have a strong effect on eGovernment and NPM innovation and diffusion processes. First, decentralisation creates a greater motivation for local governments to innovate and adapt innovations (accountability). Second, financial and managerial reforms support a decentralisation of innovativeness. Here, for instance, greater financial autonomy allows for a decentralised establishment of eGovernment and NPM knowledge in local entities, e. g. in terms of own research units. Furthermore, managerial and educational reforms build up a greater body of NPM and eGovernment knowledge among local government officials.

As a consequence, traditional top-down innovation and diffusion processes are increasingly complemented by bottom-up approaches (for other policy fields than NPM and eGovernment see [10]):

- (1) Innovation and diffusion processes in the Japanese government have a strong top-down tradition [24, 35]. Japan is often referred to as the “Catch-up state” [24] that adapts other nation’s best-practices to Japanese requirements (e. g., Prussian governmental system). Hence, also eGovernment and NPM ideas have been taken from other national practices, for instance, the British government agency system (in Japan: Incorporated Administrative Agencies (IAA)). Such top-down approach was tied to a strong central government decision-making power and an accordingly strong central government influence on local government NPM and eGovernment innovation and diffusion.
- (2) In the tide of decentralisation, an emergence of bottom-up innovation and diffusion processes can be observed. Here, the central government might play the role of a multiplier by collecting best-practice knowledge and distributing it among other governmental entities. In that regard, NPM (2007) and eGovernment (2006) best-practice case books (see again Tab. 3) play an important role. An example of such local innovation and central-local diffusion are performance measurement activities first carried out by Mie-Prefecture and today transformed into a national standard for all local governments.
- (3) In addition, horizontal-local diffusion of NPM and eGovernment innovations is characterised by a quasi-absence of central government influence. One reason for this might be that the particular innovation is still in an early phase and that the central government does not yet intend to promote this or competing approaches as ‘best-practice’. Also, particular innovations might not lie in the focus of central government attention.

The diversification of innovation and diffusion processes can be explained by decentralisation and capacity building efforts among local governments. Here, innovative local governments might perceive central government influence as (too) strong as local innovativeness still depends on central financial support to a great extent. On the other hand, at the moment central government tries to sustain certain influence on local government decision-making (see again Tab. 3) arguing that local government capabilities might not yet comply with a fully decentralised governance system. For that reason, central government, until now, plays an active and important role in NPM and eGovernment innovation and diffusion in Japan.

6 Conclusions and Future Research

Regarding the Japanese case, our study revealed a diversification of innovation and diffusion processes. Decentralisation and localisation tendencies in the Japanese governance structure open up for a decentralisation of NPM and eGovernment innovativeness. From the perspective of local government innovators, a multitude of information sources comes into play including, for instance, central government information material such as NPM and eGovernment best-practice reports, central government statutory requirements such as an obligatory “intensive reform plan”, but also mass media and horizontal-local information sources. Furthermore, decentralisation increases local accountability and consequently raises motivation for local governmental innovations. Further research might quantify the impact of particular factors.

Studying NPM and eGovernment innovation and diffusion processes, the Japanese case exposed the significant effect of decentralisation efforts and changes of governance structures. Traditional top-down approaches are complemented by bottom-up innovations and imply a central government in the role of an innovation multiplier. Such insights open up for further research which might aim at analysing how such multiplication can be improved or how particular innovation practices might be designed in order to function as role model and best-practice for other settings. Such question potentially bridges between a managerial-organisational and a multi-organisational/sectoral perspective on NPM and eGovernment innovations. Furthermore, the presented analysis framework and the Japanese case study provide a starting point for further comparative studies on IT innovation and diffusion processes in the public sector. Here, especially a comparison with federal governmental systems, for instance, in Germany or Switzerland, might be of great interest.

Our political science-oriented study on NPM and eGovernment innovation and diffusion processes revealed that the politico-administrative system entails greatest relevance for public sector innovations, let it be in the field of NPM and/or eGovernment. This calls for further interdisciplinary research that appreciates the politico-administrative embeddedness of socio-technological innovations. Here, a multi-organisational/sectoral perspective on innovation and diffusion processes provides a fruitful starting point as it addresses the question of innovation multiplication and economies of scale from a national perspective. Here, governments might investigate into which measures stimulate a sustainable innovativeness among governmental entities: Large central government-funded pilot projects or rather original means of understanding genuine (local) innovation and its multiplication (see, for instance, NPM and eGovernment best-practice reports in Japan). Here, also single-organisational eGovernment research might want to take into account the question of subsequent sectoral multiplication (e.g., what are the preconditions of such innovation, what might be possible ways of information diffusion, what are preconditions for a sectoral roll-out etc.?).

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‘Mind the Gap II’: E-Government and E-Governance

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Abstract. This paper provides a brief overview of a research project exploring citizens’ views of e-government and e-governance (the pilot study was reported at DEXA 2006). The following research propositions were investigated: i) e-government users are motivated by generic benefits offered by the Web, such as convenience and information provision, rather than democratic engagement; ii) users and non-users perceive moderate value in using e-government for knowledge acquisition and communication, but little value as a vehicle for democratic dialogue, iii) frequent users are more positive than other groups. All three research propositions are supported, suggesting that it may be difficult to engage citizens online in participatory democracy. Employing the phrase of the London Underground, we suggest that there is a Gap between e-government and e-governance that must be ‘minded’ (paid attention to). Governments should not assume that the former will morph smoothly into the latter by political will alone.

1 Introduction

In recent years the focus of the European Union’s e-government strategy has become much more ambitious, moving beyond simple interoperability to citizen participation and social inclusion. Many European nations have made great strides towards meeting the EU goals of access and service delivery, encouraging the Community to envisage a future in which citizens are linked to policy-makers through an electronic network that not only delivers public services but supports democratic participation as well. The ‘i2010’ initiative, underwritten by the e-Government Declaration by European Ministers in 2005, set specific goals in relation to inclusion, user-orientation and trust, as well as goals in the more traditional areas of efficiency and effectiveness. From this, and the subsequent updates of national strategy documents, it is apparent that political interest is moving beyond e-government (public services online) to e-governance (new forms of electronically-enabled participation) [1]. In relation to e-governance, whilst recent reports suggest increasing participation across Europe [2][3], when examined closely they reveal little about the nature of the interaction between the state and its citizens. What they actually focus on are supply-side metrics. Concurrently, there is little empirical research to support the proposition that citizens see much value in e-governance beyond the traditional e-government benefits of time saving and convenience. Unarguably, there have been some very successful local initiatives that have enhanced citizens’ involvement in decision-making [4], but it would be premature to conclude that thus far citizens using the Web to communicate

with the state feel any closer to government or more proactively engaged in democratic processes than those who do not. There is certainly a desire on the part of governments to engage citizens online, improving the legitimacy of decisions and reversing the trend of citizen disengagement. But to be successful governments need to know how citizens view the electronic platform not only in terms of service delivery but as a vehicle for democratic dialogue. This paper presents the results of an empirical study conducted in the UK in which over 300 respondents provided some indication of citizens' perceptions of the benefits of e-government and its prospects for e-governance. Much of the theoretical background to this research was already presented in the report on the pilot study [5], thus we focus here primarily on reporting the findings of the main study.

2 Prospects for E-Governance

E-government is concerned with efficiency, cost-effectiveness and seamless, transparent, integrated service delivery [6]. E-governance involves all of these *plus* encouraging citizen participation in decision-making and making government more accountable, transparent and effective [7]. It is assumed that e-governance is the next step for e-government development and political discourse now implies that the Web will play a key role in transforming relationships between citizens and state. Theoretically at least, e-governance offers new opportunities for dialogue between citizens and politicians, rebuilding public confidence and trust relatively cheaply and easily. This assumes, however, that citizens will wish to engage online and participate in democratic processes rather than simply use the new medium for knowledge acquisition, communication and entertainment. It also fails to acknowledge that citizens might feel that power relations between themselves and decision-makers are inherently lop-sided. This supports Young's [8] stance that the concept of deliberative democracy masks very real inequalities in access and power and that the notion of an 'active citizen' engaged as an equal in democratic debate may be somewhat idealised. As things stand, there is little empirical evidence that e-government enhances state/citizen relations and citizen engagement. Although theoretically the Web is well positioned to enhance democracy by providing new forms of mediation between citizens and state, it is unlikely to do so if based upon over-simplified assumptions of citizen participation, ignoring issues of exclusion, access, motivation, legitimacy and so on.

It is said that for interactive, collaborative decision-making to occur between citizens and politicians, two key elements are required. Firstly, citizens must be prepared to become knowledgeable about current issues and to express opinions (particularly on new initiatives) in order to bring clarity to the decision-making processes of elected representatives [9]. Secondly, the state must be prepared to provide timely and comprehensive information as well as channels of communication through which citizens can express their opinions and engage in debate [10]. Already at this stage problems occur. A noticeable trend in recent years has been the gradual withdrawal of citizens from the processes of democracy. In the UK, for example, voting in national elections has fallen from 71% in 1997 to 60% in 2001 [11]. Local council elections are even worse. There has been some debate about following the

Australian model and *requiring* citizens to vote, but so far this has been rejected on the grounds that it is little better than the current, flawed method. As far as state-initiated information and communication are concerned, a study of parliamentarians [10] suggests that it is not only citizens who need educating - online consultations will only be successful if *both* citizens and politicians acquire new types of communication skills and modes. Even if both these conditions are met, for representative democracy to work decision-makers must not only receive citizens' communications, but take their views into account when making decisions. This necessitates some form of open tracking to identify how decisions have been reached, who has made them, who has influenced them, and so on; going far beyond modern democracy as it is practiced in the UK, at least. It is well known that those with vested interests are able to exert disproportionate pressure on parliamentarians – highlighted recently (and rather unfortunately for the government) in the 'cash for honours' scandal. What is needed then, in this emergent e-governance age, is a realistic framework in which citizens are encouraged to engage with politicians and civil servants and in doing so may counter-balance the vested interests of the lobbyists. Realistically, citizens as individuals have little influence, however history demonstrates that the weight of public opinion *can* influence government policy eventually. Currently there is little evidence that citizens see much prospect of being able to engage decision-makers and influence them through the electronic platform; on the contrary, they seem to prefer the more traditional offline modes. Similarly, there is little sign of the politicians using the Web to invite citizens to become more proactive partners in the processes of democracy (other than a small number of consultation pages on the Directgov portal) or to promote transparency of decision-making – both of which are important in an increasingly sceptical age. It is proposed here, therefore, that when developing an e-governance strategy and Europe needs to reassess the roles and relative contributions it wants elected politicians, lobbyists, local communities and individual citizens to play in the post-modern, democratic supra-national state.

3 Research Propositions

The literature on citizens' perceptions of e-government is growing, but still relatively thin. Empirical studies have identified that generic issues such as site design, content, functionality, access, trust, control and privacy are antecedents of engaging citizens online [12] [13]. A recent study [14] suggests that, even where all these conditions are met, citizens may prefer more traditional face-to-face and telephone communication modes. In an attempt to add to the existing, limited body of knowledge a few key issues are addressed in this research, based upon the constructs in Coleman's paper [15]. For non-users in the research population, the starting-point is to assume that they perceive no added value in using e-government. Users, however, are assumed to perceive some value, to be knowledgeable and experienced enough to form opinions and to identify whether using the e-government platform brings any sense of closeness to, or engagement with the state. The following research propositions are explored:

1. Users of e-government are wholly concerned with exploiting it for online service delivery;
2. Usage intensity is related to perceived benefits – and those benefits are primarily defined in relation to the tangible elements of e-government;
3. E-government users see little value in e-governance;
4. Usage intensity is related to perceptions of the value of exploiting the electronic platform for e-governance;
5. Non-users see some potential value in e-government, but little in terms of e-governance.

4 Methodology

This study explores not the objective rationality of e-government but the subjective views of those in whose name it is being introduced. It seeks to investigate whether citizens see much value in e-governance and, therefore, whether e-governance *is* the obvious next step for e-government development. Against a background of increasing voter apathy and a widening gap between government and the people, this is of some interest. In order to gauge the true potential of e-governance, citizens' perceptions and intentions must be taken into account as well as government priorities. The study is conducted in the UK, both for reasons of pragmatism and also reflecting that the UK has consistently been ranked in the top five of the United Nations annual e-participation index [16]. For expediency, the research was conducted in a medium-sized county town in a relatively affluent region of South-East England. The population is prosperous, house prices are double the national average and internet access is amongst the highest in the country. The research population is defined as citizens who have access to the Web. Since the sampling frame (directory of postal addresses) includes both those with and without Web access, the instrument began with a filter question. Streets were selected using simple random sampling. The results of the pilot were presented at DEXA 2006, thus this paper presents the results of the whole study.

5 Findings

Over 3,000 envelopes were distributed, of which 302 were returned. Of these, 44.7% were male, 55.3% female; age was skewed towards younger people, with 69.6% aged 44 or under; there was a spread of education levels; and a surprising 75% of respondents had internet access at home. 86 respondents had not used e-government sites. Of these, 25 did not have internet access at home, with the remainder expressing a preference to communicate in other, more traditional ways such as the telephone, mail or visiting government offices. Of the 215 who have used e-government, 53% have visited local government portals and 48% central government portals (with many using both). Overall, the profile of respondents suggests that those who returned the questionnaire have an interest in using the internet and an interest in using e-government portals and may not be representative of the population at large. Concerning the reliability and validity of the instrument, Cronbach Alpha coefficients

measured .904 for the items concerning non-users; .880 for items related to benefits and .912 for items relating to e-democracy. This section presents the findings for users of e-government services, followed by non-users.

5.1 Benefits of E-Government

Citizens who use e-government services were surveyed about their perceptions of the benefits offered. The first scale of nineteen items related to generic benefits, containing tangibles such as; available 24/7, well designed, containing a lot of useful information, improving knowledge of available services, an efficient way of communicating with the state. Initial inter-item correlations indicated reasonably strong relations ($r > .400$, $p < .05$) between the dependent variable, 'are of value to me' and the independent variables, 'easy to use', 'offer high quality services', 'contain useful information', 'look after my interests', 'is an efficient way of communicating with local government', 'can be trusted' and 'protects my confidentiality'.

Exploratory factor analysis was employed to investigate which factors appear most influential in perceptions of value. Initial visual assessment of the correlation matrices indicated a reasonable degree of inter-item correlation. In addition, from the correlation matrices, the Bartlett test of Sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy index confirmed the appropriateness of the data for factor analysis (KMO = .824). Using the varimax method which maintains independence among the mathematical factors, five factors were extracted with eigenvalues > 1 , as follows: offering support (answer queries, personalize, provide support if stuck); site characteristics (well designed site, easy to use); efficient way of communicating with the state (with local and central government respectively); knowledge acquisition (useful information, improves knowledge about available services); intangibles (reliability and time saving). In relation to the first research proposition the outcome suggests that the appeal of online services is broad, not simply concerned with efficient service delivery.

Looking next at possible variances according to frequency of use, ANOVA testing was used to test for differences between those that use e-government 'whenever possible', 'sometimes' or 'occasionally', significant differences were revealed in relation to the following items; 'save time': $F(2,213) = 7.029$, $p < .05$, 'save money': $F(2,213) = 5.667$, $p < .05$, 'increase knowledge about the service': $F(2,213) = 5.177$, $p < .05$, 'able to perform numerous tasks': $F(2,213) = 4.817$, $p < .05$, 'efficient way to communicate with local government': $F(2,213) = 4.230$, $p < .05$, '... with central government': $F(2,213) = 3.236$, $p < .05$, and, 'protect confidentiality': $F(2,213) = 4.348$, $p < .05$. Independent t-tests (too numerous to detail here) indicated that most differences lay between frequent users and the two other groups, suggesting that in general frequent users discern greater value than other users. This supports the second research proposition that usage intensity is related to perceived benefits and that benefits are defined in terms of tangible elements of e-government.

5.2 E-Governance

The next items tested related to the use of the electronic platform for e-governance. Eighteen items were used to construct a scale measuring citizens' perceptions and feelings of closeness to the state. These ranged from relatively unemotional items

such as 'build up expertise', 'communicate effectively' and 'have my say' to more emotive issues such as 'feel part of an active democracy', 'decision-makers listen to me', 'my opinions matter', 'feel consulted', 'help to make decisions'. The descriptive statistics indicated that value is perceived (means >3) in relation to 'being kept informed', 'increasing understanding' 'building up knowledge', 'building up expertise' about issues and 'improving transparency of decision-making'. Means relating to the more emotive issues were all <3. Generally, perceptions of e-government as a vehicle of democratic involvement are not particularly encouraging: in terms of bringing citizens closer to the state, the mean \bar{x} =2.449, SD.967; bringing citizens closer to local government: \bar{x} =2.860, SD = .883; and bringing citizens closer to central government: \bar{x} =2.54, SD = .928. Initial inter-item correlations indicated reasonably strong correlations relations (r >.500 or above) between numerous variables. The dependent variable, 'feel part of an active democracy' is strongly correlated to 'have my say', 'decision-makers listen', 'communicate effectively with the state', 'my opinions matter', 'I am being consulted, 'I help make decisions', and 'I am working in partnership with the state'. Factor analysis was again employed to explore the data. KMO = .893, indicating the suitability of the data for factor analysis. This time three factors emerged with eigenvalues > 1; being listened to and participating in decision-making ('my opinions matter', 'I am being consulted', 'I help make decisions'); feeling that one has a good channel of communication ('communicate effectively' and 'have my say'); knowledge acquisition ('keeps me informed' and 'increases understanding'). Overall the outcomes support research proposition 3 by suggesting that the Web is not particularly supportive of variables that influence feelings of engagement.

Employing ANOVA to measure variance between users according to usage intensity, significant differences were observed in relation to three items: 'part of an active democracy' $F(2,213) = 4.633, p<.05$, 'decision-makers listen': $F(2,213) = 3.885, p<.05$, and 'feeling closer to the state': $F(2,213) = 3.557, p<.05$. In relation to feeling part of an active democracy, independent t-tests were employed to investigate the source of the variance, revealing significant differences between frequent and occasional users: $t(166) = -2.705, p<.05$, and the regular and occasional users: $t(179) = -1.940, p<.05$. Relating to decision-makers listen, significant differences emerged between groups: $F(2,213) = 3.885, p<.05$. Independent t-tests reveal significant differences between frequent and occasional users: $t(166) = -2.705, p = .008$ and regular and occasional users: $t(179) = -1.940, p = .050$. Regarding closeness to the state, ANOVA testing again revealed significant differences, $F(2,213) = 3.557, p<.05$. T-tests revealed that the differences lay between frequent and occasional users: $t(166) = 2.653, p<.05$. The results support research proposition 4, that usage intensity is related to perceptions of value in exploiting the Web for e-governance.

Examining the variables, 'generally satisfied' and 'e-government is valuable to me' across both the e-government and e-governance scales, satisfaction was rated \bar{x} =3.476, SD = .727, and value rated \bar{x} =3.527, SD = .758. Satisfaction appears to be related to tangible benefits, specifically; ease of use, offering a high quality service and increasing understanding of the services available (r >.400, p <.05 in all cases). Perceived value lies in portals being easy to use, offering a high quality service, containing useful information, communicating effectively with local government as well as the more intangible items; can be trusted, and protect confidentiality (r >.400,

$p < .05$ in all cases). None of the items relating to e-governance are strongly related to either user satisfaction or perceived value.

5.3 Non-users

To fully understand the potential of e-governance, it is also important to examine the reasons for non-usage. The findings indicate that non-users feel that e-government might provide useful information ($\bar{x} = 3.65$, $SD = .836$); that it might increase their understanding of public services ($\bar{x} = 3.59$, $SD = .817$); and might improve their understanding of local issues ($\bar{x} = 3.45$, $SD = .941$); and be a good way of communicating with the local council ($\bar{x} = 3.22$, $SD = .986$). All other means < 3 , supporting the research proposition that non-users see some value in e-government but little in e-governance. There are some interestingly strong correlations concerning trust, communication and feeling closer to the local council.

6 Discussion of Findings

The findings of this empirical study are of some interest. Firstly, they reveal a reasonable level of satisfaction amongst users of e-government services as well as reasonable levels of perceived value amongst both users and non-users. Supporting the opening proposition in this paper however, there is some indication that citizens may well have to be convinced of the benefits of engaging in e-governance. Currently, users seem pleased to use the e-government platform to access information and communicate with the state, but have little interest in engaging more proactively in democratic dialogue through this medium. Unsurprisingly perhaps, there is some evidence that more experienced users perceive greater value than less frequent users, suggesting that it might be worthwhile directing efforts towards converting occasional users to regular and regular to frequent (perhaps using tried and tested relationship marketing techniques). The factor analyses reveal some interesting insights about perceptions of e-government portals. Respondents deem it important that they offer good support, are well designed, provide an efficient means of communicating with the state, provide useful information and help to build up knowledge about available services. Reliability and time savings are also important. There are few differences between groups, but where these occur those who use e-government portals frequently are more positive about tangible benefits such as money and time savings, communication, knowledge about services.

Regarding e-governance, the findings support the proposition that users current see only limited value in e-governance. Frequent users appear to be more favourably disposed than those who use e-government less intensively. Involvement in decision-making, communicating with decision-makers and having access to useful information emerged as important factors. To feel part of an active democracy, citizens need to feel that they are listened to and that their opinions are valued; that communication is good; and that they are working in partnership with decision-makers. The challenge for policy-makers is how to exploit the Web openly and interactively to ensure that citizens feel that they are making a worthwhile

contribution and that their contribution is taken seriously. Transparency is obviously an important element – and needs to be taken more seriously by policy-makers.

The findings of this study suggest that if there is a desire to move beyond simply providing online public services and facilitate electronically-enabled governance, then citizens may have to be convinced of the benefits. Currently citizens seem to value being able to access useful information, to increase knowledge about available services, able to communicate with local and central government and are concerned that portals both assure confidentiality and engender trust. They appear generally unconvinced that the electronic platform offers overt value as a vehicle for active democracy - and using e-government does not make them feel any closer to the state. The challenge is great; it is not a simple task to convince users that their opinions are welcome, that decision-makers are interested in what they have to say and are prepared to act upon it. There needs to be a forum for exchange, a mechanism for convincing citizens that their opinions are welcomed, valued and acted upon, and a means of tracking decision-making. It may be that it is the lack of these elements that underlies respondents' view that going online helps them acquire knowledge, communicate with the state, but has little impact on their feelings of democratic involvement.

7 Conclusion

In relation to the research propositions the findings of this empirical study offer some interesting pointers. Taken holistically the results appear to suggest that citizens perceive moderate value in using e-government to access information, increase their knowledge and understanding of available services and to communicate with the state. The greatest value is perceived to be in relation to knowledge acquisition and communication, echoing earlier studies of online retailing. Overall, perceived value of using the Web to access public services is not as strong as earlier studies might suggest. In relation to e-governance, this research suggests that users appear unconvinced of the usefulness of the Web for this purpose, many commenting that they would prefer the offline alternatives. Non-users, somewhat surprisingly, appear more convinced of the *potential* value of e-governance in terms of communicating with the local council, increasing their trust in the state and feeling closer to government. Overall, respondents seem ambivalent about using the Web to engage with the state, although they perceive moderate value to themselves, the local council and central government. There seems to be some general low-level support for both e-government and e-governance, however the existence of alternative channels appears to prevent the participants in this research from becoming enthusiasts. This supports our tentative conclusion of our pilot that if citizens are to be encouraged to use e-government services, it is of paramount importance that such services offer overt and unambiguous added value over and above that provided by offline alternatives. Similarly, if citizens are to be persuaded to engage in e-governance then our findings suggest that there needs to be a much higher level of pro-activity, value must be much more clearly defined and decision-making needs to be much more transparent. In our view, if the i2010 vision is to be achieved, the focus must now shift to a citizen-informed, value-oriented approach. If citizens are to be persuaded to engage democratically online, the Gap between e-government and e-governance *must* be minded.

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Action in Action Research – Illustrations of What, Who, Why, Where, and When from an E-Government Project

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Abstract. The core content of action research (AR) is being able to solve organisational problems through intervention and to contribute to scientific knowledge. The main emphasis when discussing AR has been on the “research part”. In this paper we focus on “action part” of AR in order to generate rigorous research, to solve local problems and to deal with evident dilemmas in AR. Action elements are addressed by situations in a project on one-stop government e-service development. As a result of the analysis action is illustrated. Action elements: action, actor, motive, space, time are analysed together with roles. The paper also shows a need to understand initiation, problem and situation addressing as an ongoing process in an AR project. A breakdown in the project is also highlighted and situations where problems discovers the action researcher and vice versa.

Keywords: action research, e-government, e-service development, case study.

1 Introduction

The core content of action research (AR) is often described as being able to solve organisational problems through intervention *and* contribute to scientific knowledge. A quote from Avison et al. [3, p. 28] reflects this core content: “Action and research”. Because of the problem solving part in AR - intervention is obvious. Action researchers are intervening in social systems [17]. AR is often used within the information systems (IS) field [4], [6] and researchers have been encouraged to consider AR as a suitable research approach [13]. The publication of AR articles in the IS field has become more frequent in recent years [10]. Publications have covered both theoretical and practical issues. At its best AR contains situations where researchers (theory) inform practitioners and practitioners (practice) inform researchers in an equal and synergistic way [2].

Rigour is one aspect of AR that is criticised. AR is, like every research approach, not without its problems. This is expressed by Avison et al. [3] which highlight the “double challenge” of action and research that creates many difficulties.

The main emphasis when discussing AR has been on the “research part” of AR [3]. The content and context of AR is well reported [13]. In the case of the practice of AR

there is more of an emergent set of literature [9], [13]. In this paper we focus on action as a part when practicing AR and as an important phenomenon in order to generate both rigorous research and to solve local problems, and at the end to deal with the evident dilemmas in AR.

In order to understand AR Avison et al. [3] has discussed key aspects of the AR situation. They outline a model with three different areas. First we have the initiation of the AR project. This implies an addressing of a situation where a problem exists. This “discovery” can be initiated in two ways: the action researcher “discovers” the problems – i.e. research driven initiation, or the problems “discover” the action researcher – i.e. problem-driven initiation. The second key aspect is the determination of authority for action in the research project. The third key aspect is the degree of formalisation in the project. When performing AR projects situations are important. It is important for several reasons. The process and outcome of the situations are critical both for the local problem solving and the generation of scientific knowledge. Action and elements of action is the core content of the AR situations [3].

The purpose of this paper is to address action elements in AR, illustrated by situations in a research project (case) on one-stop government e-service development and using previous research about AR. This paper also illustrates empirically and theoretically grounded dilemmas in AR. Gaining knowledge about dilemmas and ways to handle these is important in order to use the potential within AR approach. The case that is analysed in the paper is a present on-going AR project in the public sector that consists of two inter-organisational (IO) e-service development projects. The aim of the project is described in Section Four.

The two IO e-service development projects are a part of the Swedish government focus on the development e-services and one-stop government. The background and the context to the projects is that one-stop government is a major issue in Sweden due to the differentiation and specialization incorporated in the division of the public sector, into a large number of semi-autonomous agencies [16]. The integration of agencies in a case process (e.g. the licence application handling project in this paper) is in focus, rather than the Canadian effort to build a common web portal for all agencies. The decentralized, Swedish way, of managing e-service development has been criticised by the national auditing office [15].

In order to reach a one-stop government cooperation between agencies is a necessity. Cooperation between several agencies occurs in the two development projects studied in this paper. Sweden’s County Administrations (SCoA), which organises 21 county administrative boards (CoA), the CoA of Stockholm and the Swedish Road Administration (SRoA) are all part in the two development projects briefly described above. The IO character of the development projects adds even more complexity to the AR situations and action elements studied in this paper.

After this introduction, the paper is organised in the following way: In Section Two the research design is briefly presented. AR is then theoretically described in Section Three, followed by the introduction of the AR project setting in Section Four. The empirical findings from the studied AR project is discussed and analyzed in Section Five. The paper is concluded in Section Six, where we also make some statements about the need for further research efforts and limitations.

2 Research Design

The empirical part of this paper is based on an AR project that supports the two e-service development projects presented briefly above and more in detail below. The underlying empirical work that is used in the AR project consists of modelling seminars, project meetings, semi-structured interviews and other kinds of interaction between researchers and practitioners. Empirical data in the AR project has been analysed in a qualitative, interpretive way [19]. The approach in this paper when studying action in AR and to illustrate what, who, why, where, and when is based on the empirical material mentioned and reflections of the roles as researchers in the project. The analysis of the AR situations are then structured based on the key aspects of an AR situation from Avison et al. [3]. In this part of the analysis theories guide our analysis of the empirical material [19].

3 Action Research

To solve practical problems, issues and concerns and at the same time develop scientific knowledge is the core of AR. As mentioned in the introduction of the paper this can be summarised as “Action and research” [3, p. 28]. Because of the problem solving part in AR – researcher intervention in social systems (e.g. client organisation) is obvious [17]. Another core characteristic in AR is the intention to develop a comprehensive view of the social systems that are studied. Social system is usually in transition or change when studied and intervened. The intervention means that researchers observe and participate in the studied phenomena [4].

This intention often entails research methods such as (longitudinal) case studies, participation and observation. Pragmatism is an underlying philosophy. This implies that it is important to ask the right questions, and getting empirical answers to those questions. AR on its own does not explain much. AR contains strongly post-positivist assumptions i.e. idiographic and interpretive research ideals [4]. The approach gives help to: “[...] explain why things work (or why they do not work)” [5, p. 331]. AR has its roots in the social sciences post World War II with prominent figures such as Kurt Lewin and by scholars at the Tavistock Institute [4], [5].

A research process is typically iterative and makes use of learning from practitioners and researchers within the context of a social system. It is a kind of clinical approach in terms of that it puts IS researchers in a helping role with practitioners [5]. AR is often used within the field [4], [6]. Baskerville and Myers [5] accentuate the role of AR as a valid research approach in the IS field.

The “double challenge” combining action and research is a true challenge – and many failures are reported in AR project when not controlling them enough. Avison et al [3] also elaborate on key alternatives and a control structure in order to overcome the challenge in combining action and research in the IS field. The key aspects of an AR situation according to Avison et al. [3] are: (1) The initiation of the AR project (addressing a situation where problems exist); (2) The determination of authority for action in the research project; and finally (3) The degree of formalisation of the project. When initiating an AR project there are two main approaches: The action researcher “discover” the problems – a research driven initiation or the problems

”discover” the action researcher – problem-driven initiation. When we have a research or researcher driven initiation Kock [11] has shown different forms of failure. The first is the case of “iceberg subjects” (the real opportunities for improvement is not understood by practitioners). Secondly we have the case of irrelevant subjects (there is no obvious practical problem solving involved). Third; there is no client. “No problem setting can be found that matches the theoretical frames of the action researcher.” [3, p. 30].

Determining the authority for AR project is also important. The mechanisms need to be defined early in the project. The degree of formalisation is also important when doing AR [3]. Agreements are recommended in order to specify e.g. commitments, researcher engagement and team composition [3].

The empirical part of this paper is based on an AR project that supports the two e-service development projects presented briefly above and in detail (Section Four).

4 Action Research Project Setting

The AR project setting consists of two e-service development projects. The two projects are called “the licence handling application project” and the “the driving licence web portal project”. The projects are on-going projects concerning IO e-service development in the public sector in Sweden. The aim of the initiatives is to develop one-stop government e-services for driving license matters as well as a web portal with e-services and information about the driving license process.

The overall process and background to the initiatives above is that everyone in Sweden who wants to get a driving license, first has to apply for a provisional driving license from the regional CoA. The provisional driving license is approved if the applicant is judged by the regional CoA to be able to drive a vehicle in a safe way, thus, the permit is an important aspect of traffic security. The permit application is, until the e-service is implemented, paper form that is filled in, signed and sent by mail to the regional agency. The application has to be complemented with a health declaration, a certificate of good eyesight, and maybe also an application that e.g. a parent will be allowed to serve as a private instructor. These documents are received and reviewed by a case officer at the agency. The case officer also checks if the applicant has been punished for any crimes (such as being drunk in public places, drug possession, or any traffic misdemeanour). This information is registered in a database operated by the police and the case officer has access to this information through one of SRoA’s IT system. When the provisional driving license has been granted, the CoA reports this to SRoA through this IO IT system. When the applicant has completed the driving and the theoretical test successfully he or she receives the driving license from the SRoA. The mix of different responsibilities and contacts in the whole driving licence life cycle is a good ground for constructing an e-service.

The licence handling application project aims at developing an e-service that will make an automated decision in “green cases” (cases that do not call for extensive handling processes) and support case officers handling such cases and more complex cases. By doing this the agency will try to save and reallocate resources from handling “green cases” to more complex errands. An e-service like this also provides an opportunity to standardise the application handling processes across the nation and the

21 county administration boards. The agencies also have high expectations concerning the quality of data provided by citizens. Using an e-service when filling in the driving licence application form will make it possible to automatically check the quality and the completeness of the data directly. Another advantage with an e-service will be that the underlying IT system can direct the citizen to the appropriate CoA – instead of having citizens wondering which board that will be the right one for them. The handling of provisional driving licences and the development of e-services to support this is one part of the empirical context in this paper. The driving licence application handling project is hosted by SCoA.

The driving licence web portal project is the other development project illustrated in this paper. The background of the web portal development is that driving license issues in Sweden is divided between several government agencies. It is, difficult for citizens to locate information fast and easy and get in contact with the appropriate agency when having this kind of errands. In order to make it easier for citizen to locate information and interact with the appropriate agency a national web portal is under development. The portal will cover the relevant needs along the driving licence life cycle. The web portal will provide the citizen with access to e-services and serve as a bridge between the involved government agencies and organisations. The web portal is an example of a one stop e-government solution.

The driving licence web portal project will try to combine citizen benefits and agency efficiency. The portal development project is hosted by SRoA.

In the forthcoming analysis and discussion of AR connected to these two development project we have chosen three different activities as a point of departure. The first activity is a communication analysis in the driving licence application handling project. The health declaration is an important document when applying for a driving licence. The communicative acts in such a document must be clear and easy to understand in order to fill the form in, in a sincere way. This is an issue independent of the media chosen (paper or web). The case in the project is to add a channel to communicate, implementing a form on the web as a part of an e-service. The second activity is the development of a driving licence web portal maintenance model that addresses questions of e.g. responsibility and roles for web portals, defining types of corrections, priority handling, governance models et cetera. The model was developed as a response to a direct demand from the practitioners. The demand was to identify a maintenance model that handled the IO issues of the web portal. The third activity chosen is a process modelling crash course in the driving licence application handling project. One part of the basis when designing the e-service was to map the existing and the future processes. The agency had a lack of experience doing that. As researchers we identified that lack and suggested a crash course in principles and techniques for process modelling.

Other important prerequisites for the project are formulated by the sponsor – Vinnova. The prerequisites have an influence on the situations (themes, e.g. the action elements) analysed below. The prerequisites are also important in order to understand the empirical setting and the activities in the AR project. The sponsor is focusing on benefits expected from the AR project that can be highlighted as follows: the projects should increase the cooperation between universities, enterprises and government agencies. The research should be motivated by explicit user needs. The projects

should also generate measurable effects. The results from the projects should also put into practice results from different subject areas when developing public e-services.

5 Analysis and Discussion

The situations are structured based on the key aspects of an AR situation from Avison et al. [3]; (1) The initiation of the AR project, (2) The determination of authority for action in the research project and (3) The degree of formalisation of the project. The initiation of the project is analysed as the first theme below. Situation 2 and 3 are integrated in the analysis below as a second theme. A characterization of the action elements, the focused aspects in this paper, is the third theme in the analysis below that is integrated in the presentation of the two other themes. The elements: what, who, why, where, and when are classified based on empirical data from the AR project and indicated by using square brackets, e.g. “[who]”. The empirical findings and classifications are also compared to other AR literature. The themes illustrated below also express different researcher roles and dilemmas with AR.

5.1 Action Research Situation – Theme 1 “Initiating Action in the Project”

The analysis of the AR situation will be illustrated by three different activities (communication analysis, driving licence web portal maintenance model, and process modelling crash course) from the two projects focused in this paper – the driving licence application handling project and the driving licence web portal project.

When analysing initiation in our AR project we have chosen a broader definition of initiation than Avison et al. [3]. Our experiences from several AR projects show that initiation can be viewed from a process perspective. Initiation of questions, problems and issues to study and deal with is not an activity that just happens once in a project’s life time – or in research processes in general. It is an ongoing activity that is a part of the dynamic character of an AR project – to pose questions, define and redefine problems and issues during a knowledge creation process.

5.1.1 Performing a Communication Analysis in the Driving Licence Application Handling Project

In the case of initiating a communication analysis these aspect was addressed by us as researchers (a research-driven initiation, cf. [3]) [who]. Or to be more precise: a researcher¹ “discovered” government problem. We identified a considerable risk that the existing form for health declaration, among others, with its in-built communicative weaknesses should be implemented without changes in an e-service – not taken the potential in the new media (IT) into account [why]. A research based communication analysis [8] [what] was therefore performed by us as researchers [who]. This communication analysis generated both benefits for practice (better e-services) [why] and research (experiences from using communication analysis and contributions to a method for e-service development) [why]. The action where taken

¹ Avison et al. [3, p. 30] mix the terms of “research-driven” and “researcher-driven” initiation. Kock [11], also used in [3], uses the term “researcher-driven”. We think that it is important to analytically separate the actor (researcher) from the activity (research).

as a part of the e-service design phase [when]. The communication analysis was performed at the university and reported to the SCoA [where] and later at a research conference [when, where] by the researchers [who].

The researchers' role when performing this activity has been as the initiator as discussed above, a reviewer (performing the communication analysis), direct supporting consultant (presenting alternative communicative acts and alternative terminology) and a case study researcher (analysing experiences from using communication analysis when developing e-services, and reporting to the scientific community based on that).

5.1.2 Developing a Maintenance Model in the Driving Licence Web Portal Project

Action taken that a situation needed to be addressed is in this case performed by a practitioner (the driving licence web portal project manager) at SRoA (a government problem-driven initiation, [3]) [who]. The web portal for driving licence information and e-services is a joint venture between the SRoA and the SCoA. There are several roles and responsibilities that needed to be addressed to operate and maintain this IO artifact. The agencies had no maintenance model [why] that took IO aspects into account and asked for suggestions from us as researchers. They needed drafts of different maintenance models that took the IO aspects (roles of ownership, editing, administration etc.) into account [what]. As researchers [who] we created three different drafts of a maintenance model [what] [14] that served as a basis for a decision for the joint development group with members from both SRoA and SCoA [who] on how to maintain the driving licence web portal.

The development of a maintenance model generated benefits for practice (better maintained e-services) and research (contributions to an emergent model for e-service development). The action where taken as a part of the e-service maintenance design phase [when]. The development of the maintenance model were performed at the university and reported by the researchers [who] at a project group meeting organised by the SRoA [who, where].

The researchers' role when performing this activity has been a designer (developing alternative maintenance models based on theory), reviewer (examining the present intra-organisational maintenance models), direct supporting consultant (presenting alternative maintenance models – a normative direction to practitioners' future actions) and a practice oriented researcher (constructing an emergent, general, e-service model).

5.1.3 Arranging a Process Modelling Crash Course in the Driving Licence Application Handling Project

Action taken that a situation needed to be addressed is taken this case is performed by us as researchers (a research-driven initiation, cf. [3]) [who]. Or to be more precise, similar to the communication analysis in the driving licence application handling project above,; a researcher "discovered" government problems. We identified a need of more knowledge concerning process modelling principles and techniques when designing the driving licence IT system. We identified a potential risk that the standardised system offered by the consultancy firm could overshadow the business logic and the way the SCoA would like to handle driving licence permits in the future

[why]. A process modelling course for staff at the SCoA was thus arranged by researchers. This process modelling crash course primarily generated benefits for practice (better process models when designing e-services) [why]. A secondary benefit, from a research perspective, was that we could gain some knowledge concerning the emergent model for e-service development (experiences from using process modelling principles and techniques in an e-service development setting) [why]. The development and the preparations of the course were performed at the university and held by the researchers [who] at a seminar organised by the SCoA [who, where]. The research experiences are not yet reported in an article et cetera.

The researchers' role when performing this activity has been as an instructor (developing a process modelling crash course based on theory and previous process modelling experience), consultant (presenting principles and techniques supporting practitioners' process modelling – an indirect supporting role) and secondary a practice oriented researcher (learning from agencies using process modelling principles and techniques when constructing an emergent, general, e-service method).

5.2 Action Research Situation – Theme 2 “Authority for Action and the Degree of Formalisation”

A breakdown in the driving licence application handling project occurred 12 months after the start. By breakdown we do not mean a pure clash between the involved actors. It was rather series of misunderstandings (cf. Heideggers communication breakdowns [20]), uncertainties and so on. The project, that far, had a number of situations where roles, initiatives, activities, and meetings had been misinterpreted and/or misunderstood by the parties. There were also situations where we as researchers did not have access to several important project documents.

Avison et al. [3] claim that once an AR project has been started the mechanisms by which authority is defined are very important. There is also a need to determine action warrants, power over the structure of the project, and processes for renegotiation and cancellation. This was not done properly enough in the beginning of our AR project. This is one part of explaining the breakdown that occurred.

Parts of the breakdown also consisted of the division of labour, authority and responsibility for action. Some activities (e.g. quality assurance of dialogue logic in the driving licence application handling project application construction phase) were completely distributed to the researchers in the project due to time restrictions in the SCoA. This is one example of ultimate authority distributed from practitioners to researcher of a non suitable character. According to Avison et al. [3] it is rare that organisation cede ultimate authority for organisational action to an external researcher. In this case the researchers clearly indicated that their effort in this phase should not be the only activity performed in order to assure quality in the construction. The practitioners need to take part of the quality assurance.

One of the results when discussing and handling the breakdown in the project was a more clear and communicated division between research goals and organisational problem-solving goals. This can also be directly related to the arguments of Avison et al. [3] concerning the importance when determining motives and commitments in AR projects. After the discussion and handling of the breakdown the researchers also got full access to project documents on a project groupware.

One lesson from this phase in the driving licence application handling project is that the need for current evaluation [17] should be taken more into account. An evaluation of roles, initiatives, activities, authority et cetera should have been performed earlier in the project, reducing some of the components in the breakdown that occurred after 12 months. This approach is one step towards a more formal AR project than the present project was at its start in 2005. The project in 2005 had, to a large extent, an informal character. In line with Davison et al. [10] a degree of formalisation, such as a simple contract or letter of agreement defining dimensions of practitioner and researcher engagement, mutual expectations had been helpful - probably not, to a large extent, the document in itself but certainly the process of discussing and designing the content of an explicit agreement covering the different roles, initiatives, authority et cetera in detail. We as researchers and practitioners should collaboratively have determined control structures early [10] in the driving licence application handling project.

The driving licence web portal project has not suffered from any of the challenges in the driving licence application handling project. No breakdowns. The “supply and demand” of problems and issues as well as the specific competencies held by practitioners and researchers has been very well utilised. There have not been formal in depth agreements, but oral informal agreements based on a mutual understanding and a communicated agenda. The reciprocal motives and commitments [10] have been explicit and have similarities with elements in a current evaluation [17].

5.3 Discussion

One challenge when acting as researchers in the driving licence application handling project is the project leader’s sensitivity. There has been a lot of time and resource pressure in that project. Milestones have been postponed, manning problems, strategies and communication have been more ad-hoc than planned in advance. The project leader of the licence application handling project has been “hunting” project deadlines. This process can be characterised as putting action in the foreground and reflection in the background. The ideal of AR as expressed by Avison and Wood-Harper [2] (researchers, theory, inform practitioners) usually not occur. Even direct problem solving activities and benefits from researchers in the projects have been put in the background – focusing more on (re)active activities directed by a timeline. This challenge can be a kind of failure with its roots in the researcher driven initiation shown by Kock [11]. When practitioners do not understand the real opportunities for improvement Kock [11] defines these as “Iceberg subjects”.

In the driving licence web portal project the interaction, prerequisites and results have been totally different. The project in itself is characterised by proactivity, a clear organisation and a watchful project leader. In the driving licence web portal project the “ideals” of AR, where researchers inform practitioners (and theory informs practice) and practitioners inform researchers (and practice informs theory) in an equal and synergistic way [2] is close.

The differences in the two development projects may also be explained by using Checkland’s [7] particular problem solving vs. problem situation solving. In the driving licence application handling project there has been expectations that we as researchers should solve particular problems that e.g. practitioners have not been able

to solve themselves due to time and resource pressure. In the driving licence web portal project the problems were more tied to situations with the use of comparative advantages (e.g. in competence) between practitioners and researchers. An example of a problematic situation, that needed competence from the researchers to be solved, was the driving licence web portal maintenance model described above.

6 Conclusions, Limitations and Further Research

In this paper we have been addressing action elements in AR illustrated by situations in a research project on one-stop government e-service development. We have also been using previous research on AR to guide our analysis and to relate our results into a context. This paper also illustrates dilemmas, roles and a breakdown in AR. To characterize action elements (Table 1) in an AR project one way is to deal with the dilemmas. When we deal with the dilemmas in AR projects we will be able to generate both rigorous research and to solve local problems and issues.

Table 1. Illustrations of different action elements identified in the development projects

Action (What?)	Actor (Who?)	Motive (Why?)	Space (Where?)	Time (When?)
Performing a communication analysis.	Practitioners, researchers (different roles highlighted in Section 5).	Organisational benefits and results – to solve problems.	At the organisation or at the university.	In real-time or delayed.
Developing a maintenance model.		Research results (theories and models) – papers and articles.		
Arranging a process modelling crash course.		R&D results: a method for developing e-services.		

Besides the need to be explicit about action elements showed above in order to control and understand AR projects, this paper shows that the key aspect when addressing situations and problems of the AR situation presented by Avison et al. [3 p. 29 f.] can be refined. There is a need to understand initiation, problem and situation addressing as an ongoing process in an AR project. There is also a need to understand that the situation when the problem “discovers” the action researcher can be elucidated by focusing the actor that “discovers” the problem – the practitioner, the researcher or other, single or multiple, actors.

To conclude we have also illustrated the importance of trying to achieve the ideals of AR – action *and* research arranging situations where researchers inform practitioners (and theory informs practice) and practitioners inform researchers (and practice informs theory) in an equal and synergistic way [2]. But in order to reach these ideals the illustrations shows that both researches and practitioners need to be committed, explicit in their supply and demand, and make use of comparative advantages. The two studied development projects and their relation to the AR project have illustrated different sets of characteristics compared to the ideals in AR.

The need for determining the authority for action and the degree of formalisation of an AR project [3] is evident in our study. The development projects illustrated in this paper has also shown two different sides of this coin. This is also evident for the

practitioners' expectations of what kind of support they are going to get from researchers. If the practitioners' expectations only are focused on getting "cheap consultants" – this certainly would not promote successful, or ideal, AR [11]. One can also put this argument vice versa. If a researcher only expect the practitioners' organisation to be a "quick and cheap case study" this would probably not either promote successful AR. In order to reduce or avoid the risk for such situations the need for recurrent evaluation [17] is evident in AR projects. One of the results when discussing and handling the breakdown in the driving licence application handling project was a more clear and communicated division between research goals and organisational problem-solving goals. This can also be directly related to Avison et al. [3] arguments of the importance when determining motives and commitments in AR projects. The illustrated breakdown and the results from show the importance of being able to divide research goals and organisational problem-solving goals and still be able to generate action and research.

Another conclusion is that there is a challenge and a dilemma in combining and controlling action and research. It is not impossible, there are several aspects that bring together problem solving in organisations and in research – the need for creativity, timing, systematic, regarding history and so on. The interest in and focus on theory development separates the arenas. But the theories can certainly be used to guide, focus, and develop [12] even if the case studies show that it can be differences in action logic, timing, intensity et cetera.

The two e-government projects reported in this paper also show that AR projects are highly situational [3]. The artifacts or organisations are situational; people's actions, motives, incentives, and goals certainly are. The IO character of the projects illustrated above adds an extra dimension into AR that is only partially highlighted above. This can be made as a separate theme to analyse. The fact that the context also is dominated by public agencies is another feature that can be studied more. However it is our opinion that this fact is not critical for the results on action elements and the AR dilemmas that are studied in this paper.

The empirical findings in this paper can be related more thoroughly too canonical AR [3], [12] and [18]. However this is not in the scope of this paper. It can nevertheless increase the understanding of the presented AR project. To relate to action science [1], [14] can also throw a different light on the reported AR.

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Towards a Methodology for Designing E-Government Control Procedures

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Abstract. The EU is currently modernizing customs legislation and practices. Main pillars in the new vision are an intensive use of IT (Customs becomes e-Customs), partnerships between Customs administrations and businesses (G2B), and collaboration between national Customs administrations (G2G). But how to design new customs control procedures? Very little theory exists, and an inspection of current procedures shows that they are vulnerable to fraud, and thus badly designed. Therefore we identify a need for developing theory for the design of government control procedures. Some research has been done on designing inter-organizational controls in B2B transactions. In this paper we argue that with certain modifications control principles used in B2B are also suitable for the Government-to-Business context, and we present a conceptual model for designing government controls in G2B, based on earlier work of Bons. We use a study on customs procedures for the export of agricultural goods from the EU to Russia as a proof of concept.

Keywords: e-Customs, e-Government, G2B, design methodology, conceptual modeling, procedure redesign.

1 Introduction

Globalization, growing trade volumes and an increased threat of terrorism are main drivers behind the understanding that new customs procedures and legislation are required. National governments and the World Customs Organization (WCO) recognize this reality and set a new vision for modern customs, including a shift in roles, responsibilities and underlying assumptions. Within this shift, the EU is currently reshaping its customs legislation and practices. Main pillars in the new vision are intensive use of IT (Customs becomes e-Customs), partnerships between customs administrations and businesses, and collaboration between national customs administrations. These concepts help cope with the dilemma of on the one hand increasing security, safety, financial and health requirements, and on the other hand a need to reduce administrative burden, to keep the EU a competitive economic zone.

While a lot of focus is put on the strategic vision behind new customs procedures, it is important to bear in mind the operational goals of customs control, which must be achieved by new customs procedures. To this end, existing theory on controls should

be applied when designing new customs controls. This is currently not being done: we investigated two European customs control procedures and found that they do not adhere to basic control principles, and hence they fail to achieve their control goals [13, 14]. Control in a government context is more than a safeguard of monetary value; it aims to protect the public interest, including security, health and political stability. Therefore we identify the need to establish sound theory to support domain experts in designing government controls. The theory should formulate principles for the design of government control, and a systematic, methodological application of these principles. Ideally, the theory should be supported by decision support software tools. A pre-requisite for building such tools is that theory is described (semi)formally in conceptual models.

Customs controls are governmental controls that apply to international supply chains, and hence to inter-organizational settings. While a wealth of research exists on *internal* control [e.g., 16, 18], only limited academic work on *inter-organizational* control (IOC) is available. In particular, Bons et al. argue that the same principles used for internal control can be used also for inter-organizational control [5, 6, 7]. Our earlier work [13, 14] supports this claim and presents first steps in a theory for designing and analyzing government controls.

In the current paper we continue these efforts and we present a number of contributions to existing knowledge. First, we develop control principles for G2B (Government-to-Business) and argue that they are a variation of B2B (Business-to-Business) control principles. Second, we develop a conceptual model that captures G2B control principles. This conceptual model can be used as a basis for systematic software-aided design and analysis of government control procedures. Finally, we exemplify the use of this theoretical framework in a case study concerning the export of agricultural goods from the EU to Russia.

2 Development of Organizational Control Theory

2.1 From Internal to Inter-organizational Control

Research on organizational control stems from the field of internal control. The focus of internal control is limited by a single-company paradigm, where companies operated mostly as independent units. In 1992, COSO (The Committee of Sponsoring Organizations of the Treadway Commission) issued the Framework of Internal Control, which has been used by thousands of corporations to conduct their internal control. COSO defines internal control as “a process, affected by an entity’s board of directors, management and other personnel designed to provide reasonable assurance regarding the achievement of objectives in : *Effectiveness and efficiency of operations; Reliability of financial reporting and Compliance with applicable laws and regulations*” [9].

In recent years, collaborations among organizations have increased dramatically. The focus shifted from research on a single company to research on business networks/business webs [20] or value constellations [15], and inter-organizational relations have gained their place in the academic world. Hence, also the notion of

control has been extended to an inter-organization context: “Inter-organizational controls are those measures that limit the risk a party runs in a business transaction due to the possible existence of opportunistic behavior by its trading partners” [5, p. 36]. Research on inter-organizational control (IOC) is still in its infancy and limited to business settings where all parties pursue commercial benefits. It is a pending issue to further develop the theory for relations between government and businesses (G2B).

2.2 Bons’ Inter-organizational Control Principles

An important contribution to IOC research is Bons’ five fundamental IOC principles for B2B control [7]:

1. “If a primary activity is performed by Role 1, Role 2 should testify the completion thereof using some document, which should be received by Role 1. If the party playing Role 2 is not trusted by the party playing Role 1, the primary activity should be executed after receiving the document.
2. Before Role 1 executes a primary activity it should have witnessed the performance of the counter-activity by some Role 2 if the party playing Role 1 does not trust the party responsible for role 2, unless it has received evidence that Role 2 has executed its tasks.
3. If Role 1 cannot witness the performance of a counter activity, another Role 3 should testify the completion of Role 2’s activity if the party playing Role 2 is not trusted by the party playing Role 1. This document must be received by Role 1 before the execution of its primary activity, and the party playing Role 3 should be trusted by the party playing Role 1.
4. If a primary activity is outsourced to an agent and the principal role did not previously witness the counter-performance or receive evidence thereof, the agent role should witness this counter-performance before it performs the (outsourced) primary activity if the principal does not trust his counterparty. If this is not possible, the agent role should at least receive evidence of the counter-performance.
5. If the counter-activity (by Role 2) to some primary activity of Role 1 consists of only the enabling actions of Role 2 to arrange some agent (Role 3), and not the agent’s performance as well, and the party that plays Role 1 does not trust the party that plays Role 2 and has not previously witnessed the counter-activity, Role 1 should receive an unambiguous promise from Role 3 that it will be the beneficiary of Role 3’s performance before it executes his own primary activity. Furthermore, the party playing Role 1 should trust the party that plays Role 3”.

Some important terminology has to be explained here. A *primary activity* is a “primary obligation in some underlying legal agreement” [5]. Based on the principle of economic reciprocity, a primary activity of one actor is the *counter activity* of another actor. The typical case is a delivery of goods and a payment. The delivery of goods is the primary activity of the supplier, but it is a counter activity from the buyer’s perspective. These principles assume independent and non-hierarchical relationships between organizations and pay special attention to outsourcing activities and to the reciprocal

character of contracts. Bons also investigates the ‘trust’ relationship among organizations. *Trust* is defined by [17] as “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another”. However, “trust” is difficult to quantify and has numerous interpretations [19]. Considering “trust” as control factor creates barriers for understanding and applying controls and for designing IS support. To overcome this difficulty, we assume that no trust pre-exists under B2B context, unless there exists legal/contractual constraint or other enhancement like certification.

2.3 From B2B to G2B Control

Only limited research (e.g., [5, 10]) exists on IOC, and existing research is focused on B2B relationships. A question raised here is whether control principles for B2B can be applied in the G2B context. An extensive literature review [5-10, 16, 18, 21 and more] shows that the intrinsic components of control do not differ between business and government control. Under both settings, control is affected by the interplays among three essential components: actor, activity and documents (for details, refer to [14]). We therefore argue that Bons’ control principles for B2B apply also to G2B, when following differences between B2B and G2B are taken into consideration:

- Bons’ principles are bi-directional because no trust is assumed between any two parties. We assume the government to be trusted (we consider modern democracies; in other regimes and cultures this assumption may not always be valid). Thus Bons’ principles can be applied only when role 1 is the government, and role 2 is a business.
- Therefore, the primary activity, in Bons’ terms, is the government (control) activity. Similarly, the counter activity is a business transaction that the government (primary) activity controls.
- Yet, businesses could win the government trust by means of certifications [1, 4].
- Control under B2B normally focuses on safeguarding financial profits, however, government is not profit pursuing in most cases. In the G2B context, controls not related with economic (monetary) value are also considered important (e.g., legal compliance, security and social welfare).

An important application of G2B control is Customs control. The WCO (World Customs Organization) argues that good Customs control should rely on public-private partnerships and collaboration between government organizations [21]. In Section 4 we present a case study about this issue.

3 A Conceptual Model of G2B Control Principles

The principles of Bons et al. presented in section 2.2 provide a natural language description of a theory, but they are not suitable for automation. Furthermore, they are not specific for government control. Therefore we (1) transformed Bons’ B2B control principle to G2B control (see Tables 1, 2 and 3), and (2) developed a conceptual

model to capture this knowledge (see Figure 1). As software can reason only about formalized domains, creating conceptual models of a domain (in our case: control, see Figure 1) is a pre-requisite for developing supporting software tools. Software tools will support human experts in designing government controls. They support human experts in investigating whether the current control procedures are well-designed and how to redesign a satisfactory government control (this is shown in section 4). It is not our intention to develop a software tool that would *automate* whole government controls, but rather to develop a tool that would help human experts *reason* about the design of these controls.

We map Bons' B2B terminology to G2B terminology in Table 1. Most concepts in Table 1 are assumed to be self-explanatory. The term TTP, Trusted Third Party, requires explanation. TTP is an entity which facilitates interactions between two parties who both trust it and is perceived as a widely accepted, reliable, independent, and highly secure entity that generates trust through attestation or certification [1].

Table 1. Bons' terminology transformed to G2B control terminology

Bons' terminology	G2B control terminology
Role 1	Government actor
Role 2	Business actor
Role 3	TTP
Primary activity	Government (control) activity
Counter activity	Business activity

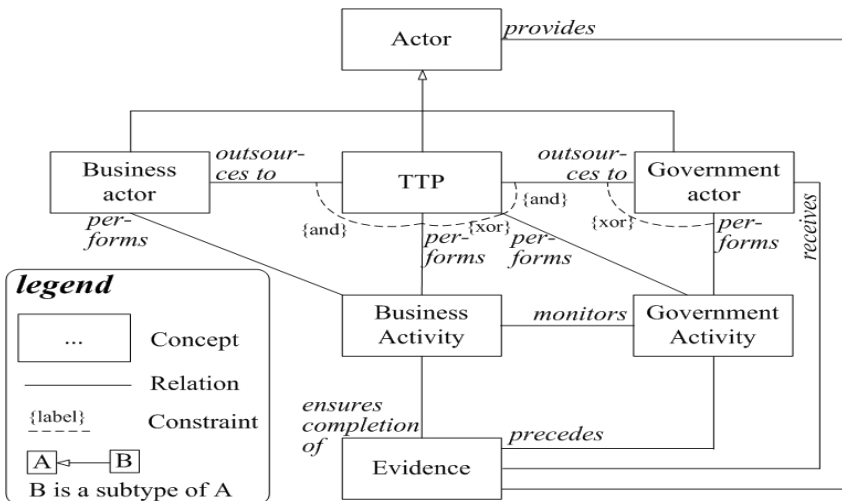


Fig. 1. A Conceptual model for G2B control principles. For details about the UML Class Diagram notation see [11].

Based on the earlier identified differences between B2B and G2B we explain in Table 2 how Bons' B2B control principles change in the G2B context.

Table 2. How Bons' principles change in a G2B setting

Principle number	G2B vs. Bons et al [7]
1	A control activity cannot take place before the business activity. The business actor is assumed to trust the government actor and need not testify the completion of a control activity. Therefore principle 1 does not apply in G2B.
2, 3	The government actor is assumed not to trust the business actor. The principles do not change.
4	Here the government actor outsources its activity. This is only possible if the third party is trusted (hence the term TTP: Trusted Third Party). Trust is typically achieved by means of certification [1]. Also, government actors typically trust each other, and hence the TTP may be another government actor.
5	Here the business actor outsources its activity to a TTP. The government actor is assumed not to trust the business actor.

This results in G2B control principles, listed in Table 3 and formalized in Figure 1.

Table 3. Government control principles for G2B

Bons' principle number	G2B control principle
1	Does not apply in G2B
2	Before a government actor executes a government activity it should have witnessed the performance of the business activity by some business actor, unless it has received evidence that the business actor has executed its tasks.
3	If a government actor cannot witness the performance of a business activity, another TTP should testify the completion of the business actor's activity. This document must be received by the government actor before the execution of its government activity.
4	If a government activity is outsourced to a TTP and the government actor did not previously witness the business performance or receive evidence thereof, the TTP should witness this business performance before it performs the (outsourced) government activity. If this is not possible, the TTP should at least receive evidence of the business performance.
5	If the business activity (by a business actor) to some government activity of a government actor consists of only the enabling actions of the business activity to arrange some TTP, and not the TTP's performance as well, and the government actor has not previously witnessed the business activity, the government actor should receive an unambiguous promise from the TTP that it will be the beneficiary of the TTP's performance before it executes his own government activity.

4 Case Study: Export from the EU to Russia

A conceptual model as in Figure 1 serves for developing decision support tools for human experts. Tools implement business rules (in our case: G2B control principles) and support humans in designing control procedures. In the rest of this section we describe how we applied the conceptual model in Figure 1 in a real-world situation to investigate whether existing G2B control procedures adhere to design principles.

4.1 Case Description

The case studied in this paper focuses on the export/import of agricultural goods from EU to Russia. When an EU company exports agricultural goods to a Russian company, two main regulations are involved: (1) The Russian buyer has to pay import duties in Russia; and (2) The EU seller applies for EU subsidies from EAGGF (the European Agricultural Guidance and Guarantee Fund). Subsidies are given to EU companies that export agricultural goods outside the EU as a means to increase the competitiveness of the European agriculture. Russian import tax is levied based on the value of the imported goods, while EU subsidies are given based on goods quantity. Following main actors are involved in this scenario: (1) seller: an EU company; (2) buyer: a Russian company; (3) EU customs at the border (e.g., the Finnish customs at the border between Finland and Russia); (4) Russian customs; and (5) EAGGF, providing subsidies. Figure 2 shows the relevant procedures; it is based on the UML Activity Diagram notation, where every column (a “swimlane”) reflects the activities (rounded rectangles) of an actor, and where the arrows denote a sequence in activities. For brevity, the figure only shows the main activities.

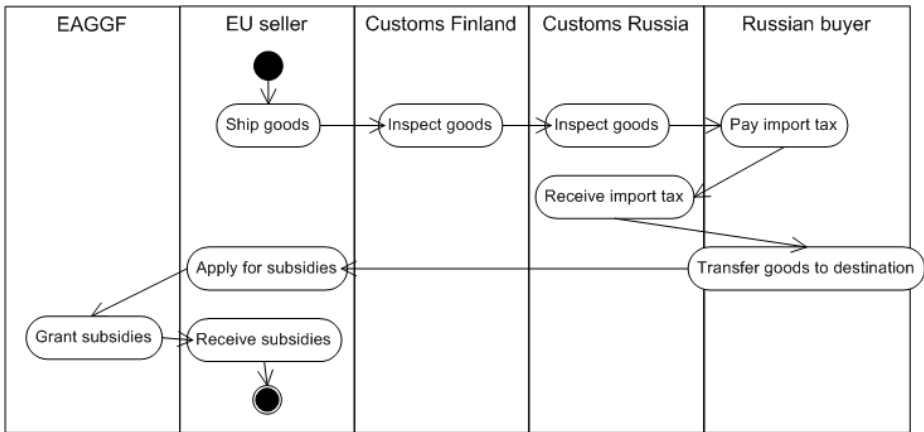


Fig. 2. Activity Diagram of the export process from Finland to Russia, focusing on EAGGF subsidies for agricultural goods

4.2 G2B Control Principles Used for Procedure Design

The conceptual model presented in Section 3 provides guidelines for designing control mechanisms to safeguard the payment of import tax in Russia and the distribution of EAGGF subsidies. Since we do not have a software tool yet, in order to test the model's computational validity, we simulate the algorithms of such a tool, and investigate the results in this section and in the next one. According to the G2B control principles, the import tax control procedure involves the following actors and activities:

- Government actor: Russian customs. Government activity: enforce tax legislation (and in particular: collect import duties).
- Business actor: a Russian buyer. Business activity: import goods.

The Russian customs does not trust the Russian buyer, and therefore requires customs control procedures (these are currently not available, as can be seen in Figure 2). This is the underlying assumption of our principles. Theoretically, an importing company could not declare any import (and thus not pay import duties), or declare a lower value of the imported goods (and thus pay less duties).

Although theoretically the Russian customs can physically inspect every shipment at the border, the lack of human resources does not allow such controls. Thus, principle 2 does not apply here because in reality the beneficiary of the business activity (i.e., Russian customs) cannot witness the buyer's performance. And indeed, in reality a practice of *double invoicing* exists. Importing companies present the real invoice to the Finnish customs, and a fake invoice – with a lower value of goods – to the Russian customs, so that they pay less import duties. According to principle 3, a third party, trusted by the Russian customs, needs to be introduced, that would testify about the imported goods.

In the interaction between EAGGF and the exporting EU companies we consider the following roles and activities:

- Government actor: EAGGF. Government activity: support European agriculture (and in particular: provide subsidies).
- Business actor: an EU seller. Business activity: export agricultural goods.

EAGGF does not trust a company that claims it has exported agricultural goods outside the EU. As EAGGF is not part of the business transaction between sellers and buyers, it has no reliable information concerning the exported goods (quantity, value). Theoretically, an exporting company could declare an export that has never taken place, or declare having exported more goods than it actually has (and thus obtain more subsidies than it is entitled to). Principle 2 does not apply here because the beneficiary of the counter activity (i.e., EAGGF) cannot witness the seller's performance. According to principle 3, a third role needs to be introduced, that would testify about the exported goods. This role must be trusted by EAGGF.

5 Designing E-Customs Control Procedures

According to principle 3, both control problems discussed above require the introduction of a Trusted Third Party (TTP) that can provide evidence of the counter

actor's performance. Double invoicing is a main problem for the Russian customs, resulting in loss of revenues. The difficulty in solving this control problem lies in the question which actor can serve as a trusted third party, with the capability to provide evidence of export from the EU to Russia.

In G2B there are mostly two types of TTPs. Either one government actor serves as a TTP for another (e.g., Finnish customs can serve as a TTP for the Russian customs; customs can serve as a TTP for health agencies), or a commercial party can be *certified* to perform certain activities as a TTP, subject to periodic audits (e.g., often security control at airports is performed by commercial companies, and not by the national authorities).

A partial solution for the *double invoicing* phenomenon (import tax fraud) is the *Green Corridor* between Russia and Finland (also Sweden is involved in this agreement). According to this agreement, Finnish companies that are certified by the Finnish and Russian customs send pre-arrival information about their exported goods to the Finnish customs, who forward this information to the Russian customs. As a result, the Russian customs receives pre-arrival information on imported goods, and double invoicing can be prevented. The Green Corridor is a typical example of e-Customs, since one of the core paper evidence documents in the control procedure, the invoice, is replaced by the direct exchange of pre-arrival information between the Finnish and Russian Customs. We see here the two types of TTPs, both of which are the result of implementing principle 3 and can be seen in Figure 3. The Finnish customs acts as a TTP for the Russian customs by forwarding pre-arrival information (government actors trust each other), and certified Finnish companies act as TTP for the Finnish customs by providing the pre-arrival information. Trust in the data sent by Finnish companies to the Finnish customs is achieved by means of certification (subject to periodic audits). While this solution works for certified companies, it does not solve the problem for most companies, because no trusted third party can provide evidence of their performance.

EAGGF also needs to introduce a trusted third party to its business process, to provide evidence of the export of agricultural goods outside the EU. EAGGF uses the Russian customs as a TTP (again: government actors trust each other). Once import duties have been paid in Russia, an import certificate is issued by the Russian customs and given to the (Russian) buyer. This certificate is forwarded by the Russian buyer to the EU seller who uses it as evidence for its performance (export of agricultural goods outside the EU) in the application for EAGGF subsidies.

Figure 3 shows a new activity diagram, where the two controls have been embedded based on Table 3. Broad arrows denote the respective concepts from Figure 1 (e.g., business actor, government actor). As there are two procedures involved, we differentiate them with different labels. *Italic* labels with a shadow background show the concepts as applied to the Russian import procedure, and **bold** labels with no fill show the concepts as applied to the EAGGF subsidies procedure. When this analysis is done using a software tool, the tool can identify situations where (e.g., in Figure 2) a control problem exists, and propose possibilities for a TTP, indicate the need for producing evidence and which actors may produce this evidence (e.g., as in Figure 3).

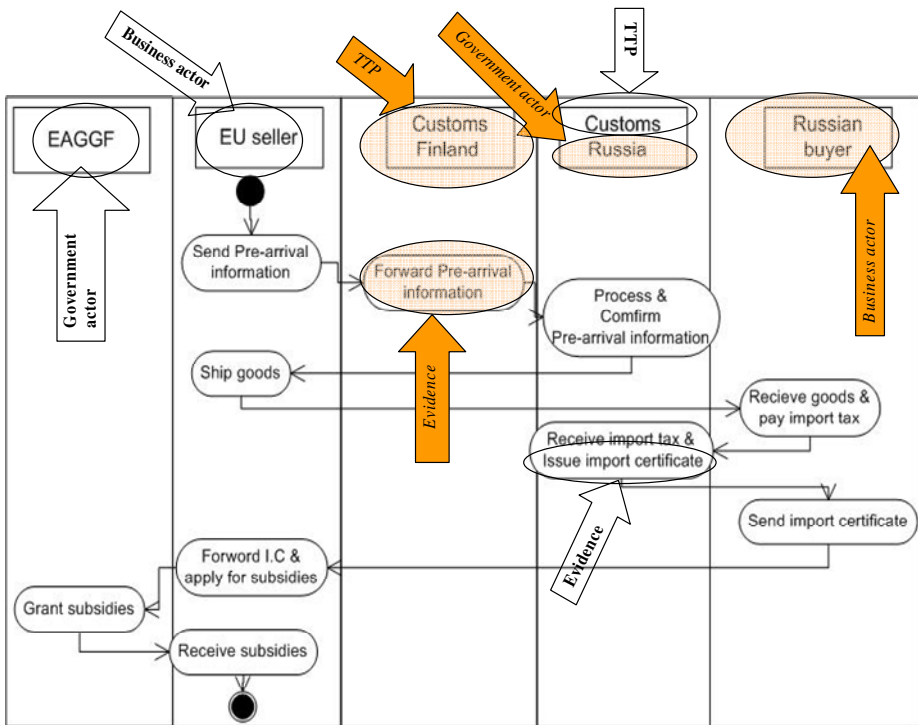


Fig. 3. Redesigned procedure for the export of agricultural goods from Finland to Russia

Due to the explorative nature of our work, no a-priori knowledge existed of how the government procedures *should* be designed. Therefore, we performed interviews with customs experts to assess the reasoning presented in Sections 4.2 and 5, and to validate the underlying conceptual model (Figure 1).

6 Conclusions and Future Work

Our goal is to develop a methodology for the design of e-Government control procedures, using Internet technology to replace paper-based customs documents by online information exchange. As such, this paper presents several contributions to existing knowledge base. First, we explore similarities and differences between G2B and B2B controls. Second, this allows us to define principles for designing G2B controls. Third, we present a semi-formal conceptual model that captures this knowledge and enables developing decision support tools to support human analysts in designing government controls and in analyzing existing controls.

Traditional research on inter-organizational control focuses on B2B. In this paper we argue that existing theory for B2B control can be used as a basis theory for G2B

control, when a number of differences between G2B and B2B are taken into consideration. The main differences between B2B controls and G2B controls are: (1) in B2B relationships we assume no trust in any direction, while in G2B we assume that government is trusted by businesses, but not vice versa; and (2) while in B2B controls are safeguards for economic value, in the government sector value is broader than Return On Investment, and includes societal, legislative and other aspects.

We take as a starting point B2B control principles as formulated by Bons et al. [7], based on acknowledged accounting and auditing theories including [8, 9, 16, 18]. We reformulate them to accommodate the differences between B2B and G2B. This results in a set of G2B control principles that are grounded in accounting and auditing theory.

We formalize these G2B control principles in a conceptual model. The main advantage of conceptual models is that they can be used as a basis to develop software support tools to assist human experts in designing and analyzing organizational artifacts. Similar models (applied to other domains) have been implemented in the past by Baida [2] and Gordijn & Akkermans [12].

A case study about the export of agricultural goods from Finland to Russia was used to test and validate our theory. Even though the case study is kept simple for demonstration purposes, we show that by applying our principles we can identify flaws in government procedures that are used daily, vulnerable to large-scale fraud. The reasoning we present in Sections 4.2 (current situation) and 5 (procedure redesign) simulates the reasoning that a software support tool would perform, once implemented based on our conceptual model. We validated with domain experts whether our analysis and its underlying conceptual model are sound and yield the desired results. In this way we establish the validity of our principles and model.

Naturally, one case study is not enough to claim that a theory is valid. Therefore we intend to apply this model to other case studies as well, covering a broad scope of government controls. We will also seek to extend Table 3 with more control principles, and extend our conceptual model to accommodate these additions. For example, the case study presented here uses *certification* as a means to establish trust instead of performing control. We will study auditing literature to formulate a principle for embedding certifications in our model.

We distinguish between (1) ICT support in the design and analysis of G2B controls and (2) ICT as a means to facilitate government control. In the current paper we present a conceptual basis for enabling the former. In [3] we focus on the latter. To this end, we are currently engaged in a number of large-scale case studies to study how ICT can change the way government controls are carried out in international trade, how roles and responsibilities can change and how administrative control can replace physical control of goods.

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Domain Specific Process Modelling in Public Administrations – The PICTURE-Approach

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Abstract. In this paper a domain specific process modelling method for public administrations is presented. The public sector is facing an increased service level demand from citizens and companies which comes along with reduced financial scope. Higher process efficiency as well as time and cost savings are required to cope with this challenge. However, reorganisation projects in public administrations with established generic process modelling methods could only identify limited reorganisation potential and just led to small local improvements [1]. Therefore, we have created the domain specific modelling approach PICTURE. The PICTURE-method applies the domain vocabulary to efficiently capture the process landscape of a public organisation. Thus, PICTURE creates process transparency and is able to detect holistic reorganisation potentials within the entire administration.

Keywords: Domain Specific Modelling, E-Government, Process Building Blocks, Public Administration, Process Landscape.

1 Process Modelling in Public Administrations

Process models have been established as a broadly applied instrument in Business Process Management [2-4]. They are used to explicate the implicit knowledge of an organisation by modelling the processes and thus, lead to improved transparency.

Public administrations are facing specific conditions when they model their business processes and try to improve them. The common public administration service portfolio is much diversified and complex [5]. Municipal processes include more than 1,000 interconnected and interdependent services and underlying processes for citizens, companies, and other administrative parties [1]. Simultaneously, public administrations are large organisations with decentralized knowledge about the processes. Usually, there is no organisational unit that has detailed expertise about the entire process landscape. New challenges like cost reduction and an increased service level demand from citizens and companies induce reorganisation pressure on the public administrations [6]. In order to be able to timely implement changes in the organisation an overview about the actual process structure is required.

So far process modelling in public administrations has mainly been performed with generic (general-purpose) languages [1, 6]. These modelling languages, such as Activity Diagrams (AD) [7], Business Process Modelling Notation (BPMN) [8], or

Event Driven Process Chains (EPC) [9], are flexible instruments to describe diverse processes in many different domains. However, they do not consider in particular public administration and reorganisation specific questions like: (1) how can a very large number of processes be acquired efficiently, (2) what changes have what impact on the process efficiency, or (3) what processes, activities, or products depend on which legal regulations [10, 11]? This results in the conclusion that these generic approaches are not suitable to represent all relevant aspects of this domain. Therefore, there is a need for a new, administration specific modelling language.

In this paper we present the process modelling method PICTURE that has been developed to address the specific conditions of reorganisation projects in public administrations. PICTURE allows for an efficient modelling of the entire process landscape of an organisation. Thereby, the specific information which is relevant for a reorganisation project can be collected. This overall view allows for reorganisation decisions that are based on the consideration of structural analogies, potential synergy effects, and economies of scale. PICTURE takes the particular legal and political constraints within public administrations into account and indicates technical and organisational measures to improve the efficiency of the process landscape.

The remainder of this paper proceeds as follows. Firstly, based on the specific characteristics of the public sector, requirements for an administration specific process modelling method are defined. Subsequently, the PICTURE-method is described as a core contribution, which works to efficiently capture the process landscape of public administrations. Afterwards, the utility of the method in modelling projects at the University of Münster and at the City of Münster is illustrated. The paper closes with a summary of the results and an identification of further research.

The research method being used for developing the PICTURE-approach is based on the work from Takeda et al. [12], Song and Osterweil [13], and Avison et al. [14]. The work belongs to the design-science oriented research [15].

2 Requirements of a Domain Specific Modelling Method

Domain specific modelling methods have gained a lot of attention in the information systems community during recent years [16, 17]. Contrary to general-purpose methods, domain specific methods are created to solve problems within a particular area of concern [18]. They apply the specific vocabulary of a domain in order to describe this part of reality. As the constructs of a domain specific method come from the domain vocabulary, the domain experts understand the meaning of the constructs and are able to adequately apply them.

A domain specific method for public administrations must consider the particular characteristics of this field. The following requirements reflect the application area of a method for public administrations in the context of process reorganisation [19]:

1. *The modelling method allows for a simple representation of the process landscape.* To model the whole process landscape of a public administration with acceptable efforts a simple language is required. If a generic modelling method is used the meaning of the constructs is mainly not intuitive and their counterparts in the real world are hard to identify. However, even knowing which modelling language constructs to pick in a certain situation does not imply the knowledge of how to

combine them. Therefore, the syntactical rules of a modelling language must also be easily comprehensible. A less complex, domain specific language is easier to learn and thus, allows for more efficient modelling as all constructs are pre-defined with meanings of the application domain. Simultaneously, however, the domain specific modelling language has to be powerful enough to gather all relevant aspects of the processes.

2. *The modelling method allows for the creation of maintainable process models.* Especially for usage scenarios within administrations, such as a model-based knowledge-management, maintenance of information technology, or continuous improvement of the business processes, actual models of the processes are important. To make sure that the process models are always up to date, the maintenance of the models has to be achievable with minimal efforts. As the modelling of processes is not the main business of officials in a public administration the models should be less complex and easy to grasp.
3. *The modelling method allows for the creation of comparable process models.* The inherent structural analogies within and between public administrations offer a high potential for reorganisation. Therefore, it is not sufficient to analyse the process models of an organisation independently from each other. It is important to identify similar or deviating structures in the models [20]. Thus, the models must be syntactically and semantically comparable. However, if two models are compared, type conflicts, naming conflicts and structural conflicts can arise [21]. *Type conflicts* occur whenever the same fact of an application domain is represented by using different constructs of a modelling method. *Naming conflicts* emerge due to the use of synonym and homonym terms in conceptual models. *Structural conflicts* result from a description of reality at diverse levels of abstraction (abstraction conflict) or whenever domain terms are modelled differently detailed (conflict of detail) [20]. To get comparable process models in this way, the degree of freedom for the modellers has to be limited. The modelling method itself should ensure that the same issue in two different cases and considered from two different persons is modelled the same way [22].
4. *The modelling method allows for the (semi-)automatic analysis of process models.* An examination of a single process facilitates the identification of weaknesses that are specific to this particular process. However, in order to discover the overall reorganisation potential it is not sufficient to analyse only the current state of a single process, but an examination of the process landscape is required. Analysing the whole process landscape of a public administration means working with a large set of data. Therefore, it is necessary to provide mechanisms within the method which allow for automatic or semiautomatic analysis of the data. Analyses of process models are made for measuring weaknesses as well as reorganisation potential. An example is the identification of so called „Ping-Pong“-processes. By counting the alternations between organisational units within the models these weaknesses can be identified, even in an automatic way.
5. *The modelling method allows for efficient modelling.* The collection of the process landscape of an administration requires not only a large modelling team but also the inclusion of many domain experts. Therefore, the modelling method has to create as little efforts as possible while gathering the process models within the public administration.

3 The PICTURE-Method

The PICTURE-method consists of a modelling language and a procedure model which guides the application of the language. Both parts are implemented in a web-based tool with the name PICTURE. After describing the PICTURE-language with its main constructs, the procedure model is explained.

3.1 The PICTURE Modelling Language

Basic construct of the PICTURE modelling language is the so called process building block. A process building block represents a certain set of activities within an administrative process [23]. Some examples of process building blocks are shown in Table 1.

Table 1. Examples for process building blocks with their specification

Process Building Block	Definition of the Process Building Block
Incoming Document	A document which arrives from an internal or external source.
Create Document	A new document is generated.
Print Document	A document is outputted with a printer.
Formal Assessment	A proposal is formally assessed and a decision is reached.
Enter Data into IT	Facts or documents are manually entered into an IT system.

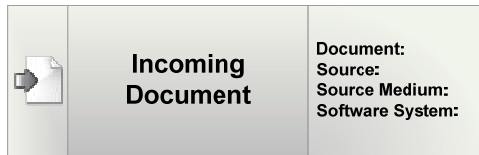
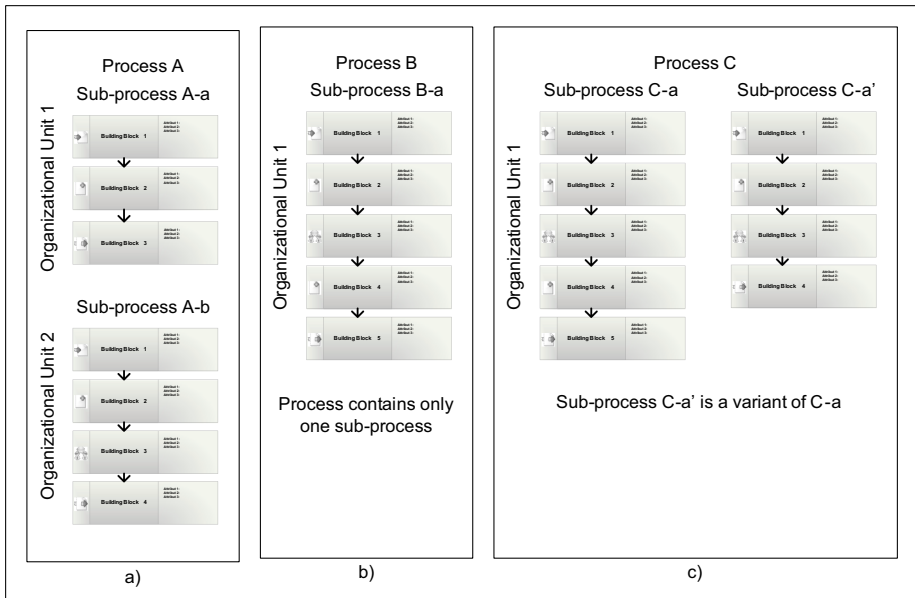


Fig. 1. The Process Building Block “Incoming Document”

The PICTURE process building blocks have been specifically developed for public administrations and apply the vocabulary of this domain. As they are domain specific the meaning of a process building block is characterised by a corresponding domain statement. Hence, process building blocks dispose of a fixed, informally defined, domain specific semantics. Contrary to constructs of traditional process modelling approaches like activities in an AD or functions in an EPC, process building blocks in PICTURE reside at a particular level of abstraction. For example a function in an EPC can be instantiated as: “Waiting for document”, “Receiving application form via letter”, or “Signing the labour contract”. These functions stand for differently abstract phenomenon in the real world. However, an instance of a process building block, for example “Incoming Document” (cf. Fig. 1), has always a specific meaning, in this case that a document arrives. The meaning is inherently pre-defined for this building block and is not specified by the modeller.

Table 2. Examples for attributes including their definitions

Attribute	Definition of the Attribute
Document	The name of the document which is moved or processed. For example an application form or an official notification.
Source	Source of a document or information, e.g. a person, organisational unit or organisation.
Source Medium	The medium in which a document or information arrives. For example telephone, fax, mail or e-mail.
Processing Time	Time in minutes it takes to complete a certain activity.
Software System	The name of the software system which is involved in this activity.

**Fig. 2.** Processes, sub-processes and process variants

In PICTURE the process building blocks are the only way to describe the administrative processes. This simple syntax makes the modelling easy for the method's users. Furthermore, processes are represented as a sequential flow of building blocks. Also this syntactical restriction guides the method's user and simultaneously promotes the construction of structurally comparable models. Since only process building blocks can be used, the type of each model element is not just syntactically but also semantically fixed. Problems like *naming conflicts* in a model comparison are avoided, because the name of a process building block is specified by the language designer rather than the modeller. However, the modeller is allowed to fill a text field with additional information about a certain process step. These comments are not considered during the analysis.

With building blocks the sequential order within administrative processes can be specified. However, in order to identify reorganisation potential this information is not

sufficient. Additional facts about the processes can be collected with the help of attributes assigned to the process building blocks. For example possible attributes for the process building block “Enter Data into IT” are “Source”, “Source Medium” or “Processing Time” (cf. Table 2). Attributes provide the core information for a subsequent process analysis, in which, according to predetermined goals, corresponding weaknesses and potentials are detected.

As processes in public administrations run mainly decentralised in responsibility of several officials the modelling efforts for collecting the whole process have to be distributed. To address this problem, in PICTURE a process can consist of several sub-processes (cf. Fig. 2 a)). A sub-process is a process section being carried out by a responsible official or a position within a single organisational unit. Sub-processes can be linked together to visualise a whole process. The majority of the modelling activities take place on the sub-process level. In this way the modeller has to collect all the relevant information from his local view on his part of the whole process. An example is the “building permission” which has sub-processes “comments of the environments-office” or “monitoring of the building-phase” with different responsibilities. However, some processes contain only one sub-process (cf. Fig. 2 b)). An example is the process “Notification on fees for a motor vehicle”. The modelling with the PICTURE-language is strictly sequential. PICTURE offers no language constructs to represent forks in the course of process building blocks. It is also not possible to model iterations. To describe technically important ramifications in the process flow, PICTURE offers two different ways: On the one hand attributes can be used to specify different cases with percentage values. For example an incoming document can arrive in 50% of the cases through the communication medium mail, in 30% per email, and in 20% per fax. On the other hand it is possible to specify process variants (cf. figure 2 c)). A process variant defines an alternative sequence within a sub-process. Process variants contain, in comparison with the original sub-process, many common process building blocks. However, some of the process building blocks have been modified, new ones have been added and some have been removed. The frequency of a process variant can be weighted by percentage values.

3.2 The PICTURE Procedure Model

The procedure model of the PICTURE-approach contains three steps. In the first step the PICTURE-method is adapted to the specific characteristics of the project. In the second step all relevant data is acquired by using the modelling language. In the third step this data is analysed in order to prepare reorganisation projects and to identify savings potential.

The first step during an application of the PICTURE-method is to define the objectives of the project. In order to collect only information which is needed for the subsequent analysis (cf. requirement 5: efficient modelling) the PICTURE-method can be customised for the specific properties of a project. The PICTURE-method comes with a list of possible project goals such as “Development of an organisation wide IT strategy” or “Implementing an organisation-wide document management system”, or “Systematic identification of media breaks”. The selection of appropriate objectives is performed in a goal-finding workshop together with the users of the models. This approach improves the acceptance-rate of the following modelling project as the users have already been involved in the pre-project-steps. If for example

the project goal is reorganisation then it is important to acquire the duration of activities. If the objective is to define a new IT strategy it is essential to document the existing software systems that support the processes. The configuration of the method results in a choice of the attributes which are required in order to meet the information demand derived from the project goals. Before PICTURE can be applied it is essential that the project objectives are communicated within the organisation and the project is supported by management and staff.

The second step of the PICTURE-approach is to model the entire process landscape. Therefore, modelling teams must be established and modelling orders have to be assigned. PICTURE focuses on a strong involvement of the officials of an administration in the modelling project. There are certain questions for example about the execution of processes and the frequency of certain tasks that can only be answered by a responsible official or his supervisor. Due to the fact that in order to represent the entire process landscape many officials must participate, the collection of the processes is very time consuming. It is a main contribution of the PICTURE-approach to enable modelling in a distributed manner. The collection of the process models must be performed in a coarse granular form to reduce time and efforts for modelling. The method supports the illustration of mutual dependencies between process models. The mechanisms of the PICTURE-approach allow for independent and local modelling activities.

The third step is to analyse and use the process models. In a complete acquisition and structuring of all administration processes lies an added value, since it fosters transparency. The PICTURE-method supports cataloguing the processes according to different criteria. Possible features are the structural organisation of an administration as well as a list of services. The presentation of a structural organisation is often comparatively easy because an existing administration organisation plan gives good guidance. In contrast to that, there is often no reference for a compilation of a catalogue of services. Based on the process models covering the entire process landscape PICTURE supports the development of a catalogue of services. The PICTURE-tool allows for a publication of this catalogue on the internet or the intranet. The online catalogue can be used for internal knowledge transfer to new officials or as external knowledge-base for citizens and other stakeholders.

The current state of the process landscape documented by the models can indicate reorganisation potential. For example the number of printed pages in an organisation per year, the travel time of the officials or the amount of work interruptions influences the organisation's efficiency. If these attributes are included the models critical processes can be tracked down and analysed in detail. The holistic overview shows saving potentials no longer only for single organisational units like departments or offices but for the whole administration. Additionally, by defining certain patterns of process building blocks frequent interdependencies between departments (so called ping-pong processes) can be discovered or unnecessary media breaks can be detected. An example for such a pattern is if in one sub-process a building block "Print Document" is found. In the subsequent sub-process there exists a building block "Enter Data into IT" for the same document. This could indicate an unnecessary media break and could be the starting point for an in-depth analysis as part of a reorganisation project.

Beneath organisational measures the reorganisation potential of IT basic components like document management systems, knowledge bases or virtual post offices can be estimated. IT basic component can supersede certain activities in processes or change the sequence of activities. For example the process building block “Enter Data into IT” can be removed without substitution if a document management system provides the same information electronically. As the PICTURE-method provides information on the entire process landscape the quantitative and qualitative effects of the introduction of a certain technology on an organisation can be assessed.

4 Evaluation of the PICTURE-Method

Two case studies have been performed in order to evaluate the PICTURE-method. The approach has practically been applied at the University of Münster as well as at the City of Münster.

University of Münster: The University of Münster is a public institution with about 40.000 students and an administration engaging 500 officials. In this case study 34 interviews with officials of the university’s administration in six different departments were conducted. The project group was composed of a project manager, four sub-project managers and seven team members. Each interview was conducted by two team members together with one or two officials of the administration. In these sessions, altogether 168 processes could be identified and modelled. During the interviews, all processes were documented on paper. Process building blocks were applied to structure the discussion. After the interviews, the processes were translated into the PICTURE-language and sent back to the interview partners for review. If any corrections were made by the administration’s officials the process models were adapted accordingly. It took 477 person hours to identify and document the processes, on average approximately three person hours per process. Only one person hour of these three hours was needed to model the processes. The rest of the time was used to prepare interviews, write a protocol and give feedback to the interviewers. Based on the experiences made a few missing process building blocks and a couple of attributes could be identified and were added to the language. Forty proposals for improvements could be derived from the PICTURE process models. With help of the PICTURE tool the process models have been published on the intranet of the university.

City of Münster: The City of Münster has about 280.000 inhabitants and an administration with roughly 4.000 officials. Fifty-one interviews have been accomplished at seven different departments of the administration. A project manager, five sub-project managers and 14 team members were involved in this project. Based on the interviews 172 processes were identified and documented. These processes have been collected in two different ways, paper- and tool-based. Thirty-eight processes were acquired in the traditional form, first on paper and later modelled with the PICTURE-method. The remaining 134 processes were modelled directly during the interviews together with domain experts. For this purpose the web based PICTURE-tool was applied. As the process models were created within the interviews together with the administrative officials, a later review and rework was no

longer required. We experienced a much higher quality of the models with this second form of acquisition. Further inquires while modelling the processes in the tool as in the first option could be completely omitted. With the first version it took two-and-a-half person hours to acquire a process. More than one person hour was necessary to copy the processes from paper into the PICTURE modelling tool. Another 30 person minutes were required to prepare the interviews and to ask for feedback. With the second option a process could be finished in one-and-a-half person hours. Besides preparation most of this time was spend modelling the processes with the tool. Even though, it took somewhat longer than documenting on paper, the time for the transfer in the tool and later rework could be saved. Discussions with the administration's officials during the project showed that they appreciated the method as it is simple to understand and creates transparency in their processes.

Table 3. Process acquisition times

Project	Form of acquisition	Time to acquire a process
Regio@KomM	Paper based	6 person hours
University of Münster	Paper based	3 person hours
City of Münster	Paper based	2.5 person hours
City of Münster	Tool based	1.5 person hours

In comparison in the Regio@KomM project processes of a municipal administration have been acquired with the modelling language EPC [1]. The processes were comparable in structure and size with those at the University of Münster and City of Münster. In the Regio@KomM project the collection of 22 administrative processes took six person hours on average. The paper based modelling of a single process with the PICTURE-method required only half of that time. With the tool based modelling the time could be further reduced to a fourth. The participants at University of Münster and City of Münster who had previous experiences with EPC modelling evaluated the PICTURE-approach as faster to learn and its models as easier to understand in comparison to EPC. Table 3 shows the different efforts per process and per project.

During the two projects the PICTURE-method was continuously evaluated and adapted if required. All inadequacies of the modelling method were documented [16]. During the project meetings obvious improvement possibilities were discussed and implemented throughout the course of the project. The reactions of the officials to the application of the method and all recognised advantages were noted. Also restrictions of the PICTURE-method were gathered in an evaluation document.

5 Conclusions and Further Research

Public administrations possess many properties that differentiate them from enterprises. A process modelling method must take these particular characteristics into account in order to be applied successfully. The objective of our research has been to develop a domain specific modelling method which meets the particular conditions of public administrations. Considering these specific features we have derived requirements in

order to allow for an efficient representation of the process landscape as well as the identification of reorganisation potential in public administrations. We developed the PICTURE-method to enable an economic modelling, analysis and presentation of administrative processes.

Comparing our results from the two case studies with the initial requirements we found that all of these conditions could be met by the PICTURE-method. The abstraction level of the process building blocks proved to be suitable. A better comprehensibility of the models compared with previously used generic modelling methods was explicitly emphasised by the involved officials (cf. requirement 1). Through modelling with the help of abstract process building blocks, structural variations could be observed less frequently compared to generic process modelling methods. This led to lower maintenance expenses, as rework efforts and the number of necessary changes on the models could be reduced (cf. requirement 2). Through the use of same process building blocks in different process models, the comparability of the models has been promoted. Furthermore, problems such as name or type conflicts within a model comparison have been reduced [24] (cf. requirement 3). Although, the focus of the two case studies primarily laid on the creation of transparency, some simple analyses based on the process models could be performed [25]. With the aid of building-block specific attributes, such as turn-around time, drop number or number of printed pages, these figures could be aggregated and calculated for each organisational level and unit (cf. requirement 4). Furthermore, the process building blocks of the PICTURE-method proved to be very easy to understand for the officials. We could show that the PICTURE-method shrinks the time to acquire a single process up to a fourth compared to the language EPC (cf. requirement 5).

An important conclusion of the two case studies is, however, that not every type of process can be modelled similarly well. Especially less structured processes and processes which are not based on documents were hard to grasp. Based on the results of the evaluation of the PICTURE-method the following objectives for further research can be defined:

1. *Complex analyses:* As described in section 3 the PICTURE-method provides mechanisms to measure the reorganisation potential of basic components. The current version of the method requires manual support to estimate the effect of certain software systems on the process landscape. This part of the method has to be improved in order to provide valid indices for basic components and to evaluate whether their introduction is economically reasonable. It is subject to further research to develop improved pattern-based heuristics for a fully automatic analysis of the collected processes.
2. *Stand-alone modelling:* In the project with the city of Münster 29 of the overall 134 tool based processes have been described without the support of a method expert. Two officials modelled their processes on their own and needed only about 30 minutes to represent a single process. The quality of these modelling results was notably high. This reveals a significant additional potential to further reduce the efforts of modelling the process landscape. However, the PICTURE-method and the tool must be improved in order to employ stand-alone modelling in an entire administration. This is subject to further research.

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Building a Local Administration Services Portal for Citizens and Businesses: Service Composition, Architecture and Back-Office Interoperability Issues

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Abstract. Two of the most active research fields in information technology nowadays are Internet Services Portals used by governmental organizations and Interoperability Patterns for achieving the seamless cooperation of heterogeneous existing systems. When referring to e-Government applications in Local Administrations, the above mentioned research fields have to be tackled, as the resulting systems need to be functional, easy to implement and maintain, capable of interconnecting with back-office systems and citizen and employee friendly. This paper shows that the conceptualization, design, implementation and maintenance of Municipality Service Portals can be standardized, following a specific methodology. Piloted in a Greek Municipality with almost 50,000 citizens and 3,000 businesses, the methodology comprises of (a) rapid process modeling with the use of BPMN-aware modeling tools, (b) CCTS-based data modeling (c) step-by-step adaptation of Content Management, Citizen Relationship and Workflow Systems, (d) SoA-enabled interconnections with back-office applications and (e) overall guidance based on Service Composition taxonomies.

Keywords: e-Government, Interoperability, Local Administration Systems.

1 Introduction

The rapid development in Information Technology is nowadays opening new horizons regarding the facilitation of everyday life of computer users. As the Internet becomes a daily activity of people's life, more and more organizations tend to offer internet based services, replacing their traditional front-desk transactions. Following this trend, governmental organizations, such as local governments, local administration and various public service offices are constantly launching e-Government portals that are not only offering information to the public, but offer electronic flavored services as well, by promoting interoperability with the present underlying systems that are currently serving the public [1].

Local Administration Entities, such as municipalities [2], are topping the list of such organizations, as they have high figures of everyday transactions numbers with citizens and also possess a large number of "clients", which are naturally the

inhabitants and the locally based enterprises. The benefits that rise from such a portal are the following [3]:

- Alternative service channels for the citizens and enterprises such as Internet, Mobile phone access and also voice access with the use of Interactive Voice Response (IVR) systems.
- Optimization of the service levels as the on-site presence becomes unnecessary.
- Exclusive services for facilitating different groups such as disabled persons, the elderly, the youth, etc.
- Workflow optimization and automation in the highest possible degree by standardizing processes and documents
- Effective cooperation between different in-house departments of local administration, by intergrading and interconnecting services and processes that take part in common transactions

This paper presents a complete methodological procedure for setting up Municipality Service Portals which was successfully applied in a Greek urban Municipality with almost 50,000 citizens and 3,000 enterprises.

2 Building E-Government Portals – Frameworks and Standards

Municipal e-Government Portals, which will offer automated services and would address the public, it is essential to comply with international standards and system design techniques that should guarantee the end system's functionality and feasibility. This chapter presents the most important frameworks and standards that should be followed when designing and implementing e-Government Portals [4].

This paper presents an Overall Methodology for the rapid development of local administration e-Government portals which consist of the following steps: (a) rapid process modeling with the use of BPMN-aware enterprise modeling tools, (b) CCTS-based (Core Component Technical Specification) data modeling in XML, (c) step-by-step adaptation of Content Management, Citizen Relationship and Workflow Systems, (d) SoA-enabled interconnections with the back-office applications and (e) overall guidance based on Service Composition taxonomies containing more than 200 already modeled services to citizens and business[4].

2.1 E-Government Interoperability Frameworks

Various Frameworks are nowadays present, offering the guidelines that should be followed when designing systems and applications seeking interoperability with underlying systems.

Those frameworks are defining in detail:

- Certification Frameworks for Public Services web sites
- Interoperability structures for interconnecting systems and developing applications
- Digital Authentication structures for the end-users
- Standardization Meta-Data and XML Schemas for data entities

The most known frameworks are the following:

- The UK Electronic Government Interoperability Framework (e-GIF) [5]
- The German SAGA [6].
- The European Interoperability Framework (EIF IDABC) [7].

Although all the above mentioned frameworks deliver detailed information and guidelines about central government systems, they fail to introduce specific information and overall rules regarding local administration portals and services [8]. In this direction, the work presented in this paper comes as a methodology which will enlarge and complete such frameworks with typical architectures and generic local administration patterns for achieving interoperability at municipal level.

2.2 Standards

International Standards and state-of-the-art Modeling Languages and technologies should be used in any e-Government portal as they preserve the feasibility, the accessibility, the accessibility and the security of the end product which is the portal. A complete list of standards and methodologies which should be examined and used during the portal implementation is presented below.

Data Related Standards and Technologies. These standards are focusing in the data entities which are included and transferred within the portal. Data has to be modeled in a specific way, so that systems can easily handle it and process it. The standards to be considered are:

- Unified Modeling Language (UML) [9], for modeling data components and forming widely accepted formatted documents.
- eXtensible Markup Language (XML) [10], for modeling document data.
- XML Schema [11], for forming the XML Documents and introducing their generic formats
- The Core Component Technical Specification (CCTS)[12], for building up the data structures from baseline and elementary data components
- Dublin Core Metadata Initiative [13] for metadata description

Process Related Standards and Technologies. As the portal will provide automated services to the public, it is essential to identify and to model the underlying processes which will be inserted during the implementation phase to the portal. The end solution should be based on:

- Service-oriented Architecture (SoA) [14] for enabling interoperability between the e-Government portal and the underlying back-office local administration systems.
- Web Services [15], with their respective underlying specific standards like Simple Object Access Protocol (SOAP) for data encapsulation and transport[16], Web Service Definition Language (WSDL) for service description [17] Universal Description, Discovery and Integration (UDDI) [18], Web Services Flow Language (WSFL) [19] Business Process Execution Language (BPEL), for modeling, orchestrating and implementing transaction flows using Web Services [20], [21].

Security and Authentication Standards and Technologies. Security is at outmost importance for such a system, as the transferred data are quite sensitive and the services offered should be defended from malicious users and intruders. Therefore, cutting-edge technologies are considered, that guarantee the data integrity and the fraud-free operation of the system. Those technologies include:

- Cryptography, (symmetric cryptography, asymmetric cryptography, Public key cryptography (Rivest-Shamir-Adleman (RSA) algorithm), Digital Signatures) [22]
- Internet Protocol Security, a developing OSI-Layer protocol which includes protocols like Secure Sockets Layer (SSL), TLS (Transport Layer Security)
- S/MIME (Secure Multi-Purpose Internet Mail Extensions)
- Firewalls
- HyperText Transfer Protocol Secure – HTTPS
- Public Key Infrastructure (PKI) [23]

Other Standards. Apart from the above mentioned standards, an e-Government portal should also respect other standards as well, mainly for the presentation of the context, based on the World Wide Web Consortium (W3C) specifications. The Web Accessibility Initiative (WAI) is such a standard which aims at disabled people facilitation for accessing internet based systems.

The presented approach is demonstrating the application of the above standards in the local / municipal level. This specific effort, in Greece and in other developing countries, where internet penetration and information technology's application is still in low figures, is a very demanding context, due to lack of resources and technical expertise in public administration which are small or medium governmental organizations [24]. Therefore it is essential to provide a complete solution, using cutting edge technologies and standards, which will ensure the proper and less demanding function of such systems in terms of maintenance and administrative operation.

3 Portal Design, Implementation and Support

As with any information system, the work structure for deploying an e-Government portal does not differ a lot from similar projects. However, there are some work packages which should be considered of highest importance, as they are the ones offering the added-value to the system and are essential for the fruitful operation of the portal. Those deal with the selection of the processes which will be offered electronically, the data and process modeling, the implementation of the interoperability layer and the interconnection of the various subsystems and the developed applications.

3.1 Service Analysis, Categorization and Selection

Prior to the process modeling study it is essential to establish a way for analyzing and selecting the Local Administration Entity's services towards the citizens and

enterprises, in order to allocate in a complete and definite way the processes that are going to be automated through the portal [25].

As a start, the 4-level model adopted by the European Commission was adopted, stating four different levels for electronic services [26, 27]. Those levels are:

- **Level 1 – Information.** This level contains only information about the corresponding service.
- **Level 2 - One-way interaction.** A 2nd level service provides to the end user downloadable material, such as .pdf forms or similar documentations which have to be filled in by the user and handed to the corresponding office.
- **Level 3 - Two way interaction.** This level provides on line tools where a user can fill in his request and initiate the process of the transaction. For completing the transaction, the end user must appear at the service office and collect his receipt. Services offered in level 3 require the authentication of the user.
- **Level 4 – Transaction.** Services in the 4th level are fully automated and the end user gets the service's output in electronic format, after imitating the transaction. Such services include steps as authentication, decision, notification and delivery of receipt.

The services that the Local Administration Entities provide to citizens and businesses shall be evaluated, aiming at the plotting of a map containing those services that are going to be provided to the public through the portal. During the evaluation, after being categorized in the four-level model, the services are sorted by the life events towards the citizens, by the business episodes towards the enterprises and by several other parameters, such as the nature of each service (information, transaction, declaration, print of certificates), the targeted audience (citizens, enterprises, disabled persons, Local Administration Entity staff) and the way in which a service is provided (automated services and level of automation, support by other information systems).

The parameters that are used for the sorting and the evaluation of the services are:

- Frequency of use , meaning the total request made to the corresponding office for the specific service)
- Effort, describing the inter-organization work-effort which is required for completing the services life-cycle
- Importance (following European directives)
- Input Independence, which points out the required input documents for executing the service
- Support by Information Systems, describing whether the specific service is operated by using information systems
- Independence of Execution Frame, pointing out whether the service is provided within the “authority borders” of the municipality or whether contact and information flow between other organizations is required (e.g. interaction with police departments).
- Reliance on other Services, pointing out whether the service includes the execution of other services offered by the organization.
- Demand for onsite presence, which points out if the presence, in person, of the applicant is required.

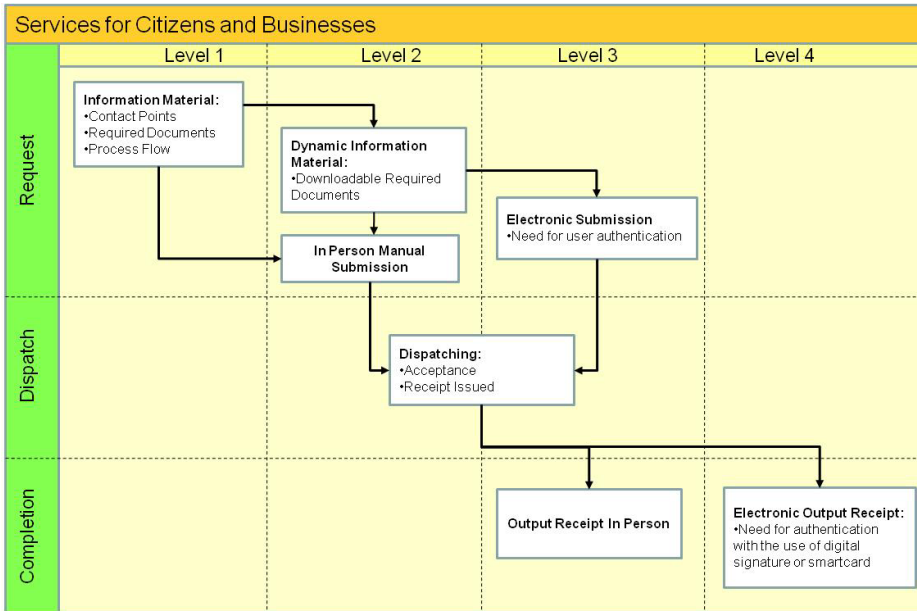


Fig. 1. The service workflow, organized in the 4-Level model

The above criteria are applied and scored for each of the 200 services. The sorting and the evaluation of the scoring, which are done by applying multi-criteria methods, such as the ELECTRE TRI [28] method, result to a classification table of those services, based on their potential of becoming electronic, the respective automatic transaction level they can reach and their overall importance – thus providing for a service-driven overall guidance and prioritization of the portal implementation.

3.2 Process Modeling

State-of-the-art modeling notations and methodologies have been selected for the process modeling phase. Namely, the Business Process Modeling Notation (BPMN) [29] has been used in order to extract executable code from the designed models using the Business Process Execution Language (BPEL).

The process modeling captures the flow of the steps, inputs and outputs for every service described, resulting in a coherent representation of:

- The Local Administration internal processes followed for each service provided.
- The communication with other entities that provide accompanying services or support processes for the completion of a service.
- The input documents, the output documents and the service-internal documents generated and exchanged.
- The various document exchange flows between the involved entities

The target of the above process modeling is the analysis of the existing situation (as-is) but mostly to drive the transformation of manual or lower-level electronic processes towards the implementation of level-3 and level-4 processes by the Municipal Portal.

3.3 Data Modeling

Unified governmental data models for facilitating the seamless exchange of information and the deployment of interoperable systems in Central, Regional and Municipal Government appear today as critical yet less touched issues that deserve more in depth exploration [30]. None of the current European or National e-Government Interoperability Frameworks which were mentioned above – often characterized as the e-Government Bibles – has developed a universal language to describe the semantics of governmental data in unambiguous terms. Second, the development of repositories of XML schemas for the exchange of specific-context information throughout the public sector, albeit recognized as the most significant achievement in data modeling, is observed in isolated cases, like United Kingdom's e-GIF Registry.

The UN/CEFACT Core Component Library (UN/CCL) represents the repository for generic business data components, the so called Core Components. Based on the experiences gained in previous data standardization efforts, the CCL does not provide pre-determined, static or industry-specific data definitions, but comprises a huge set of context-agnostic, generally valid data templates (e.g. postal address, personal information) that are syntax-independent and represent the general business data entities which are commonly used in today's business processes. The Core Component Technical Specification (CCTS) [12] [31] is the associated method comprising meta-models and rules for the semantically unambiguous definition of business information on a syntax-independent level. The UN/CEFACT Naming and Design Rules (NDR) [32] define a set of guidelines for transforming CCTS based artifacts into XML Schema and XML based instances.

The methodology for the data modeling follows the next five steps:

- i. Study of the map of services to be automated
- ii. Record of all the necessary documents (service inputs or service outputs)
- iii. Elaboration of the documents in order to recognize the most frequent used structures, such as the citizens' personal data
- iv. Creation of core components, according to the Core Components Technical Specification (CCTS) methodology, for the most frequent used structures
- v. Creation of standard input and output documents
- vi. Creation of generic pan-European documents by merging the different standard documents of the various national levels

3.4 System Architecture

The system architecture is based on n-tier architecture (data layer, application layers, presentation layer). This particular approach allows the scalability of modules according to the portal needs, as the portal size and its functional requirements will

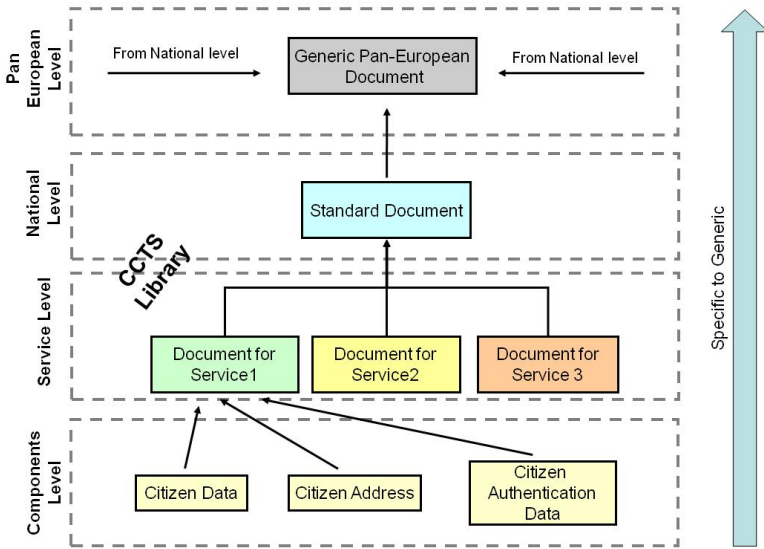


Fig. 2. Creation of Standard e-Government Documents using a CCTS-compliant Methodology

guide the total implementation. Moreover, the sorting of operations in distinctive levels in order to avoid unequal burdens of particular sources, or of the whole system is also guaranteed by the 3-tier architecture chosen and last but not least this architecture offers the option of selective expandability with no changes in the system's infrastructure.

Figure 3 describes the logical architecture of the system which contains parameterisable Common Off-the-Self Components (COTS), open source components and be-spoke components. The core platform is an open source Content Management Platform System (CMS). This system handles the presentation of the information and offers out-of-the-box tools for the implementation of services belonging to levels 1 and 2. Other systems are Workflow Engines, Citizen Relationship Management Systems and IVR Systems for enabling voice access.

The Content Management Platform the Citizen Relationship Management System (CRM) and the Workflow Engine all cooperate as the core transactional components of the system. The CRM serves the user authorization and identification and tracks down all user activities, namely from simple queries or questions asked, to the current status of an online submitted application. This way, the end-user is constantly aware of his opens issues and on the other hand, the administration authority is able to generate the end-users profile in order to target the most needed services, an important issue in e-Government portals [33].

Finally, the Workflow Engine offers the flexibility of adding, replacing and updating working processes, without requiring great code-writing efforts. This way the process flow is constantly managed and the system guarantees the flow of documents to the appropriate users even at heavy loads, surpassing the operation of manual systems in Local Administration [34].

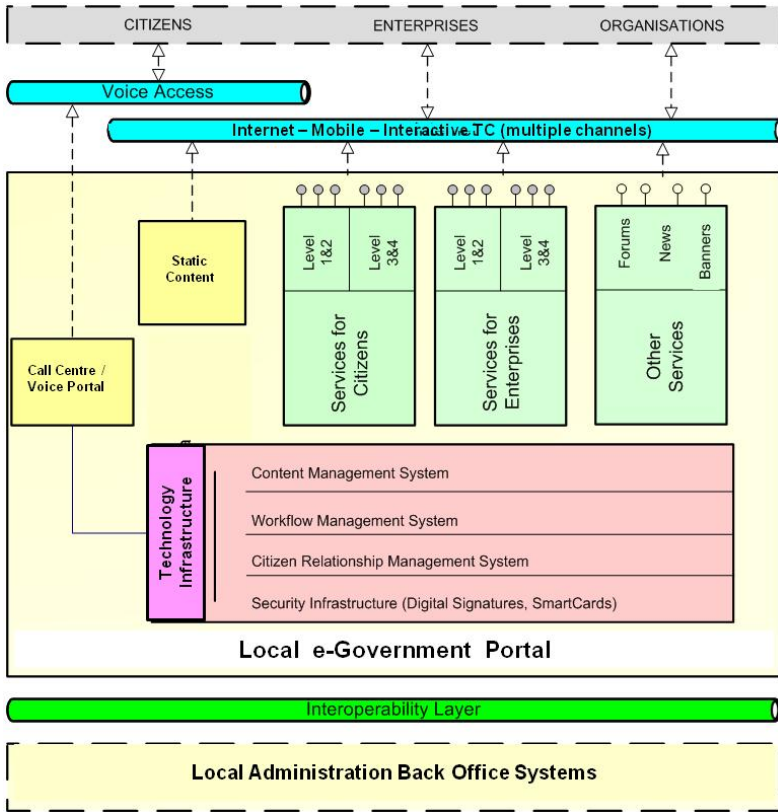


Fig. 3. Logical Architecture of the System

3.5 Interoperability Layer

The interoperability layer is essential for the e-Government Portal, if services of level 3 and 4 are offered to the public. The portal will operate as a front-end interface for the internet users, in order to be served by the Local Administration back-office systems. As those systems are of different technologies and of different generation (in Greece are typical client/server, quite hard-wired applications), interoperability is the key which adds value to the e-Government portal by achieving the interconnection and the cooperation between heterogeneous systems.

This layer is designed in such a way that future enhancements are possible and that system and platform independence is preserved. It contains “Encapsulation Software Components (Wrappers)” that are responsible for the data transportation between the Back Office systems and the Portal, through specific interfaces.

As depicted in Figure 4, from each back-office system only the required input and output interfaces, that became active during a transaction, are selected in a purely “follow the service” approach. Those interfaces are connected with the Wrappers which facilitate the information flow to and from the portal with the use of Web Services [35]. This approach enables the interconnection of the different subsystems and guarantees the high performance as only the required interfaces are used.

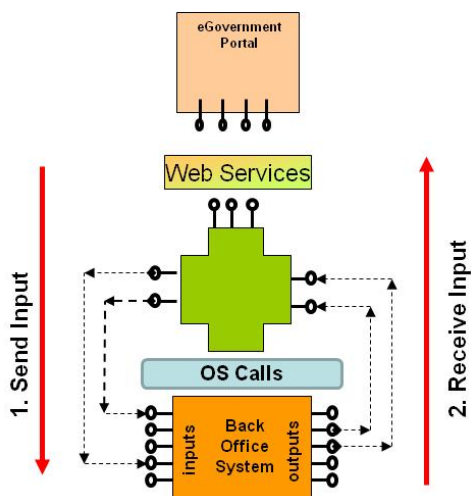


Fig. 4. Interoperability Layer Architecture

In order to implement this architecture, the following steps are needed:

- i. Discover the inputs and the outputs of the back-office systems.
- ii. Modeling the data that is transferred within the system using XML.
- iii. Protocol and Communication channels development. This refers to the wrappers and the web services development by defining the communication ways with the back-office systems (.Net Calls, RPC Calls, Intermediate Tables, Direct DB Calls) and the portal (XML Schemas, Service Calls)
- iv. Definition of workflow and application calls. The application call can either be triggered by the portal (in case of a request submission) where the portal is initiating the call and waits for a reply but can also be trigger by the back-office system itself (in case of a notification for a fee payment)
- v. Development of Security and Authentication mechanisms.

4 Conclusions

The paper presents an overall methodology which is aiming at the automation of the complete set of services offered by a governmental administration in local administration level. The whole methodology was piloted in a Greek urban Municipality (Ag. Paraskevi, bearing 50,000 citizens and 3,000 businesses) with very positive initial results, both from the employees and the citizens. Reusable patterns and methods springing from this holistic approach are:

- The real problem definition, based on the formal description of almost 200 services to citizens and businesses, using process and data modeling tools, assisting in the creation of Pan-European e-Government Services (PEGS) at local and municipal level.

- Prioritisation of the services, based on the impact they have for the citizens and businesses.
- The construction of a Generic a Reference Architecture for Public Administration Portals including parameterisable systems (CMS, CRM, WFMS, Security Infrastructures) and be-spoke components.
- Utilisation of the CCTS methodology for defining the needed XML documents.
- Service-driven components for the interoperable operation of the portal with back office systems

Moreover, the methodology will be further developed by its inclusion within the Greek e-GIF (the municipality will also be a pilot municipality in eGIF). Furthermore, as the current Greek e-Government strategy targets a wide area of public administration organizations, the presented approach will be extended in order to satisfy all uprising requirements as portals are built for larger municipalities.

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Reference Models for E-Services Integration Based on Life-Events

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Abstract. Modelling life events is a task of a crucial importance and a first necessary step towards supporting resolution of a particular life event on the active e-government portal. The use of reference models as templates for building life-event models promises savings in time and costs of the modelling process. At the same time, using reference models can increase the quality and accuracy of the established models. The paper proposes a complete set of life-event reference models at different abstraction levels that allows for modelling and implementing virtually any life event. The types of reference models range from a general one that provides template for any life-event model, to reference models specialized for establishing models of a specific life event in a specific country or a region or tailored to a set of specific user circumstances and needs.

1 Introduction

Life event denotes a specific situation or event in the life of a citizen that requires a set of public services to be performed [17]. Life events are supposed to help citizens to identify the set of public services they need at certain stage in life and provide guide for performing them. Establishing a model of a particular life-event is a task of a crucial importance and a first necessary step towards supporting resolution of a particular life-event on the active e-government portal that guides citizens through the process of life-event resolution [19]. The experience of domain experts with the task of life-event analysis and modelling shows that it is a demanding task that takes a lot of domain expert time and can lead to inaccurate models [17, 13].

Reference models can simplify the modelling task by providing domain experts with guide through the modelling process and model templates. While many papers propose reference models for individual public services, no reference model for the task of modelling life events has been developed so far. In this paper, we propose life-event reference models that domain experts can use as templates for integrating public services related to any life-event of interest. We propose useful reference models at different abstraction levels. At the highest level of abstraction, we propose a general life-event reference model that provides template for modelling any life event. Reference models on lower abstraction levels can help domain expert with modelling a particular life event in a specific country or a region. Portal software can tailor the reference models to a set of specific user circumstances and needs and thus personalize integrated e-services delivery. We show the usability of the proposed

reference models by matching them against actual life-event models developed by domain experts in three different countries: Slovenia, Hungary and Poland.

We organized the material in the rest of the paper is organized as follows. Section 2 defines the reference model term and reviews literature on reference models in the public administration and e-government domain. Section 3 introduces reference models and analyzes their utility by matching them against actual life-event models. Section 4 put the proposed reference models in a hierarchy of abstraction levels that provide guidelines for their use and discusses possible directions for further research.

2 Reference Models

This section reviews related literature on reference models. In the first part, we review definitions of the term reference model and put our reference models in the context of these definitions. Second part focuses on reference models in the public administration and e-government domains.

As already noted in [16], there is no clear and unified definition of the term “reference model”. The most general one defines it is a point of reference for the development of specific models [3]. Following other definition, reference models represent general recommendations for the subject domain of interest [18]. Since reference model represents generalization [1], we can also refer to it as a generalized model. Taken this into consideration a reference model is generalized abstract representation of something complex using rules that test and ensure the logic (i.e. consistency, coherence, alignment) of the arrangement of the parts¹. In any case, the use of the reference models promises savings in time and costs with increasing the quality and accuracy of the constructed models at the same time [16]. Most definitions of the term also agree that a reference model consists of a minimal set of unifying concepts, axioms, and relationships within a particular domain, and is independent of specific standards, technologies, implementations, or other concrete details².

According to [15] a reference model is as an abstract definition of how to describe and develop a domain of interest: a model of modelling. Reference model defines: (1) building blocks (usually abstract concepts) used to build models in the particular domain; (2) relationships between these building blocks; (3) a recipe for building specific models. In [15], authors also state that a reference model becomes more useful, if (1) it includes examples of specific models developed using it and (2) it specifies the features of the domain that are left out of the model.

Reference models may exist for two distinct applications [7]. HOW reference models specify the process of model development, while WHAT reference models provide templates for specific models. Note also that reference models are descriptive and prescriptive at the same time, since they should provide appropriate generalizations of existing domains on one hand, and aim at delivering blueprints for good system design on the other [10].

¹ Adapted from the definition of the term “model” found at http://www.tbs-sct.gc.ca/btepto/documents/2004/gloss/gloss_e.rtf

² <http://ontolog.cim3.net/file/resource/workshop/jul-2006/soa2006-07.ppt#276,15,Description>.

Most reference models proposed in literature refer to the business process and process based information systems development domains (functional area). A process reference model represents dynamic aspects of an enterprise, e.g. activity sequences, organisational activities required to satisfy customer needs, control-flow between activities, particular dependency constraints etc. [4]. In this paper, we focus on modelling life events, which present the front-office part of business processes. While our previous papers focus on HOW reference models in a form of methodology for modelling life events [17, 13], here we develop WHAT reference models.

The review of literature on reference models in the public administration domain shows that there are several proposals for process reference models, which are more focused on back-office processes, e.g. [2, 6]. However, only few papers and projects deal with reference models of e-services (the overview being provided in the next two paragraphs), and there is no related literature on life-event reference models, which would have a narrowed focus on the front-office part of administrative processes.

Schmid [14], OL2000 [12] and Lenk [11] contributed a variety of reference models for delivery of electronic public services, especially with respect to defining principal stages or phases of administrative process with the emphasis on the corresponding front-office activities. The most comprehensive model proposed by Lenk [11], defines seven phases of the service delivery process: information, intention building, contact, negotiation, contract, execution and aftercare.

On the other hand, Service Flow Management approach [9] focuses on the sequences of service tasks and the respective relations between client and provider, with particular emphasis on social relationships and interactions. While these relationships are difficult to structure and standardize, the resulting reference model is more general than the three ones presented in the previous paragraph.

Finally, authors in [8] propose three types of public service reference models: (1) generic reference model, which represents a general template for modelling any service; (2) basic reference model for a particular service; and (3) specific reference model for a service performed by a specific public administration unit.

3 Towards Life-Event Reference Models

Having reviewed state-of-the-art reference models in the public administration domain, we continue with specifying life-event reference models. The focus of the presented related work is mostly on reference models of individual public services with an emphasis on electronic delivery of public services. The aim of reference models proposed in this paper is different. Our reference models should support the process of modelling life events, i.e., they should allow easy integration of different public services instead of modelling individual public services. While authors of [17] and [13] propose HOW reference model that guide domain experts through the life-event modelling process, we focus here on WHAT reference models, i.e., models that provide domain experts with templates (starting points) for crafting life-event models.

In the first subsection, we discuss the generality of the notion of a life-event model. We show that the generic (or interactive) life-event models that support active-portal development are reference models, since we can use them to automatically infer specific models tailored to citizen specific circumstances and needs. In the

continuation of the section, we also present two other types of reference models at higher abstraction levels. We first demonstrate that the models of the same life event in different countries have similar structure that we generalize in a so-called cross-country reference model for a particular life event. Experts can use this reference model when establishing a model for the same life event in other countries. Finally, in the last part of the section we present a general template that allows building a model of virtually any life event. We will also show how this second general reference model relates to the HOW reference model presented in [17] and [13].

The figures used to represent life-event models in this paper are prepared following the Business Process Modelling Notation (BPMN). For complete explanation of the semantics of the building blocks used in BPMN workflows, please refer to [5]. In brief, rounded corner boxes represent public services that citizen has to perform in order to resolve a particular life event. Solid arrows determine the ordering of the services. Dashed arrows correspond to document flow between services. Light-border and bold-border circles correspond to the start and the end of the life-event resolution process respectively. Finally, diamonds correspond to decisions that citizen has to make during the process (if labelled with text) or to split/merge process flows (if labelled with “+” or “x” signs). Following the BPMN notation, we always embed these modelling elements within labelled rectangles called swimming pools and lines. They denote public authorities and users who are in charge for performing the activities denoted by the modelling elements.

3.1 Generic vs. Specific Models of Life Events

Note that life-event models can also appear at different levels of abstraction [17]. The models at interaction level, used to build active e-government portals, are generic models of life events that correspond to a number of different citizen-specific circumstances, interests and needs. Consider for example the “getting married” life-event model presented in Fig. 1³.

If we start with the analysis of the workflow from the starting point at the top-left corner, we see that the resolution of the life event first depends on two citizen circumstances, i.e., being a minor and wishing to marry outside official premises. Both circumstances require citizens to perform additional public services. The important point to make here is that different decisions taken by couples interested in marriage will lead to different life-event models tailored to couples’ specific circumstances and needs. We refer to the tailored life-event models as specific life-event models as opposed to the generic one that captures all possible circumstances.

In the context of reference models, the generic model from Fig. 1 is a reference model of a very limited scope. It can be used to build a number of specific “getting married” life-event models, two of them being presented in Fig. 2. We obtain them by following only those paths in the generic model that correspond to the specific decisions made by the citizens. The example on the left-hand side of the figure corresponds to the most common case of marriage between two adult citizens that

³ Note that the presented model is a simplification of the complete “getting married” life-event model in Slovenia – we simplified the model to focus the presentation.

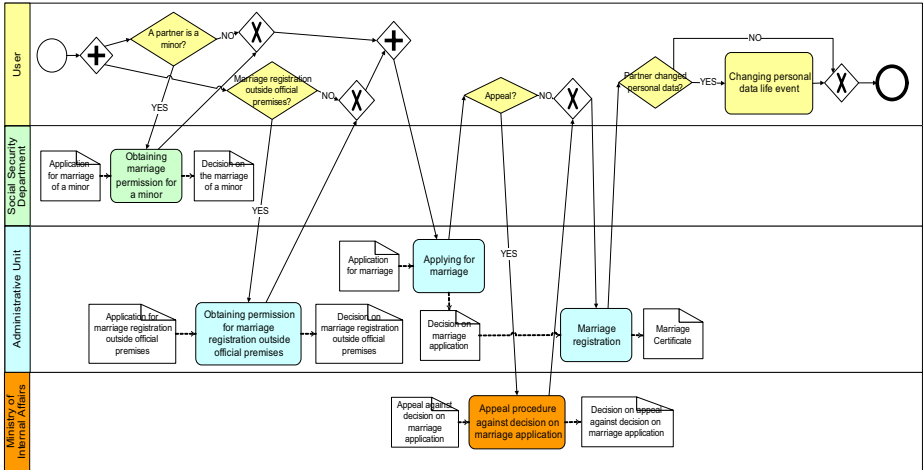


Fig. 1. An example of generic model for the “getting married” life event

need to perform only two public services. The example on the right-hand side correspond to a much more complex (and rare) case of a minor citizen wishing to get married outside official premises.

Despite the limited scope of the generic life-event models when we consider them as reference models, they might correspond to a wide range of specific models. The example model from Fig. 1 corresponds to sixteen (16) different specific models that originate from four circumstances. Two possibilities relate to the citizen circumstance “being a minor” (he/she is either a minor or an adult); two possibilities to the couple wish to get married outside official premises; two possibilities to necessity of appeal against decision taken in the marriage application public service; and finally, two possibilities relate to the need for after-care due to change of personal data. Since an arbitrary combination of these possibilities can appear in practice, the example general model defines $2 \times 2 \times 2 \times 2 = 16$ possible specific life-event models. As already mentioned, Fig. 1 depicts two out of this sixteen specific models. It is easy to notice that the number of specific models corresponding to the generic one is closely related to the complexity of the generic model, in particular to the number of user circumstances that influence the process of life-event resolution. For example, the complete generic workflow for the “getting married” life event in Slovenia, define the vast space of 256 specific life-event models.

Note that we usually do not refer to the generic life-event models as reference models: we rather use them as an interactive life-event models that are necessary in order to provide citizens with a real active guidance through the process of life-event resolution. Once the generic life-event model is established, the process of tailoring them to a specific situation is fully automatic and does not require any manual work by domain experts. Thus, the generic life-event models are reference models, but domain experts usually do not need to use them as templates for manual model construction. Note that the analogy of the relationship between generic and specific

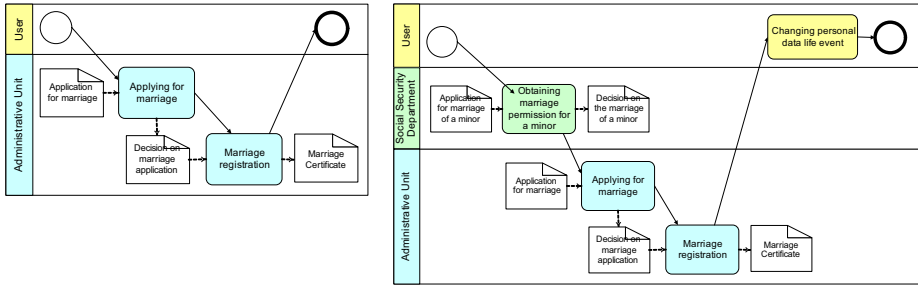


Fig. 2. Two specific models of the “getting married” life event. The model on the left-hand side corresponds to a situation when two adult citizens decided to leave their personal data intact by the marriage. The model on the right-hand side correspond to a situation where a minor citizen is getting married and one of the partners decided to change his/her personal data.

models, elaborated here, is known in the area of business process modelling as the relationship between (generic) process model and (specific) process instance. In the following two sections, we shift our focus to templates that can be useful to domain experts in the process of manual development of life-event models.

3.2 Cross-Country Reference Model of the “Getting Married” Life Event

A possible approach to building a reference life-event model is to analyze a number of life-event models, identify their similarities and common workflow patterns, and generalize (or aggregate) these common patterns into a reference model. We follow this approach here by analyzing models of the “getting married” life-event in three countries: Slovenia, Hungary, and Poland.

The comparison of the three models shows a number of common characteristics. First, in all three cases, we can identify two crucial public services: one related to the act of applying for marriage or expressing a wish to get married, and the other related to the act (or ceremony) of marriage registration. Second similarity is that that prior to the first crucial service (applying for marriage), partners have to perform a number of other (preparation or support) services related to their specific circumstances. All three models share two such circumstances: being a minor and being a foreign citizen. The third pattern that we can identify in two (Slovenia and Hungary) out of the three models is that after registering the marriage, married partners typically need additional after-care services related to change of personal data, that is change of their last name and/or change of the address.

Taking into account these three common patterns, we can compose a “getting married” reference model, which is similar to the model in Fig. 1. To transform that model into a reference model one should replace all the specific public services, authorities, and circumstances with generic ones. Such a model represents a template that domain experts in any country can use to build a “getting married” life-event model. When doing so, they should follow the following four steps.

Step 1: Identify the citizen circumstances that have important influence on the marriage. In order to make this task more straight forward, we augment the reference model with an aggregated list of citizen circumstances included in the “getting

married” life-event models in Slovenia, Hungary and Poland. The list includes seven circumstances: (1) one (or both) of the partners is (are) minor(s); (2) one (or both) of the partners is (are) foreign citizen(s); (3) one (or both) of the partners has (have) been previously married; (4) one (or both) of the partners is (are) in a death-threatening medical condition; (5) witness of the marriage is foreign citizen; (6) partners are close relatives; (7) partners wish to register their marriage outside official premises. Domain expert can use this list as a guide and keep in mind that it is not complete or exhaustive. For example, analysis of the “getting married” life event in Romania [13] shows that citizen being in an active army service needs a special permission to get married issued by the army. Thus, when building a model for “getting married” life event in Romania, one should include this circumstance (and the related service) into the model.

The list of identified circumstances influences the upper left corner of the template: domain expert should replace the two diamonds in Fig. 1 with a number of diamonds, each of them corresponding to a citizen circumstance identified in this step.

Step 2: Identify and analyse the support public services. For each circumstance identified in the previous step, domain expert should identify a (set of) public service(s) needed by the citizens in this circumstance. Domain expert should furthermore analyze each public service in order to identify what public administration body provides the service, what documents are necessary, etc. (i.e., following the HOW methodology for life-event analysis from [13]). Domain expert will then use the results of the performed analysis to replace the second and third swim-lines of the reference model (labelled with generic label “Support Service Provider”) with appropriate swim-lines corresponding to the actual service providers and with specification of the particular input/output documents.

Step 3: Identify and analyze the crucial public services. After the analysis of the support services, domain expert should examine the central or crucial public services needed by a couple in order to get married. The usual sequence is outlined in the reference model, domain expert should however revise the sequence, if necessary, and specify the provider(s) of these services (i.e., re-label the third swim-line). Finally, domain expert should analyze the appeal procedures for these services and identify the public administration body that is taking care of the appeals. The labels of the elements in the graphical model should reflect the actual public service titles identified during the analysis.

Step 4: Identify and analyze the after-care services. Finally, domain expert should identify the after-care public services that married couples need. In Slovenia and Hungary, the after-care handles the change of personal data; in particular, this might include change of the last name for one or both partners or change of the address due to the move. Note however, that domain expert decides whether to include these services in the model or not, e.g., Polish model does not include any after-care services, due to an expert decision. Having reference model as a template, would help experts build complete models.

The steps described above can be also considered as a HOW reference model that accompany the WHAT reference model for the “getting married” life event. Note furthermore that although we illustrate the cross-country reference models on a single example of “getting married” life event, we believe that the concept of cross-country

reference models is more general and can be developed for any other life event that is not specific to a particular country or region. However, due to the limited number of life events modelled within the project, we are not able to support this claim with any empirical evidence. Further modelling efforts in different countries are necessary in order to develop cross-country reference models for other life events.

Before concluding the section on cross-country reference models for a particular life-event, we should note that in analogy with them, we could also specify cross-region reference models. A cross-region reference model provides a modelling template for a particular life event in different regions of the same country.

3.3 General Life-Event Reference Model

The previous section presents bottom-up approach to building reference models: we started with “getting married” life-event models from individual countries and using generalization and aggregation, we got a cross-country reference model for the “getting married” life event. Bottom-up approach is a plausible approach when we have a number of life-event models to start with. Due to the limited number of available models, in this section we take an alternative top-down approach. We start with the modelling principles established in the HOW reference model from [17] and develop a WHAT reference model that follows them.

The most important step in the process of analysing a life-event is to identify public services that citizen need to perform in order to resolve the life event. To simplify the process of identification, we specify three categories of public services with regard to the role of the service in the life event.

The first and most important class of services includes *crucial* public services. These services are necessary for all citizens that are interested in resolving the particular life event. Typically, the execution of this service during the life-event resolution is unconditional (see, e.g., “applying for marriage” in “getting married” life-event models). However, there are cases when in different circumstances, citizen need different crucial services for resolving the same life-event. A good example of a later is crucial service in the “lost document” life event in Hungary. The public service is crucial only for those citizens who lost their identity card and have interest for obtaining a new one. In any case, each crucial service is to be accompanied by a corresponding appeal procedure (public service again) that citizen triggers when he/she is dissatisfied with the outcome of the public service.

During process of identifying crucial services, domain expert works under assumption that whatever support documents citizen needs to perform these services, he or she already has them. However, this is not true in all cases, and citizen has to perform additional public services to obtain them. Many of the required documents depend on specific citizen circumstances. For example, permission for marriage of a minor is a document required for minor citizens only. The services needed to obtain necessary documents are in the second class of services, we refer to as *support* public services. Note that the number of support public services for a particular life event can be very large, since some public services have to be included in virtually any life-event model. Examples of such services are “obtaining an identity card” and “obtaining a birth certificate”.

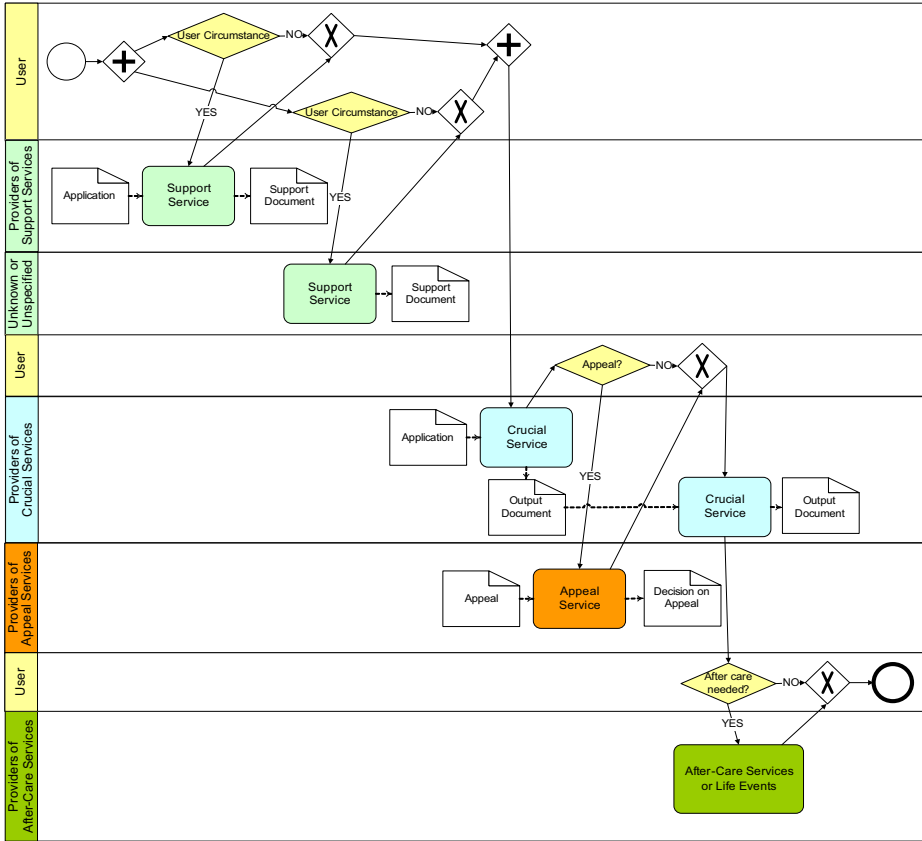


Fig. 3. A schematic representation of a general life-event reference model that can be used as a template for modelling virtually any life event

The last category of services includes after-care public services (or life events). This category includes services typically needed by citizens after they finished the process of resolving the current life event.

Putting these three categories in a template results in a schematized reference model depicted in Fig. 3. Analysis of how this model matches the twelve models developed in three countries (Slovenia, Hungary and Poland) shows that we can group the models in two classes. In the first class containing nine life events, the models are direct instantiations of the general life-event reference model. The matching of each specific model against the reference model identifies crucial, support and after-care public services in each model. The life events included in this class are diverse: the class includes “getting married” life-event in all three countries, “establishing a business” (different kinds of business, ranging from sole proprietorship to a small enterprise), “closing a business” or “building and registering a guest house” life event.

Note however that there are exceptions: the three life events in the second class are not direct instantiations of the reference model presented in Fig. 3. Yet, they all

follow the same mismatch pattern. Namely, all three life-event models cover life events where the set of crucial services needed depend on specific citizen interest. Resolution of “organizing a public gathering” in Slovenia, depend on the scale of the event. For small-scale gatherings, citizen only have to express interest at a local police station, otherwise he/she has to apply to the local public administration unit. Similarly, resolution of “lost documents” and “retirement” life events in Hungary, depend on citizen interest in a specific retirement plan or specific interests about the set of documents he/she wants to re-gain. In all three cases, the decision made by the citizen influences the set of crucial services needed and not only the support ones. In all three cases, the diamonds in the top-left corner of the Fig. 3 also influences the flow in the pool related to the execution of crucial services.

In sum, the matching of the individual specific models against the template shows that the reference model, with minor changes in rare cases, represents a comprehensible template for modelling virtually any life event in any country or region of interest. From that perspective, the general reference model, presented here, represent a prescriptive model that provides a blueprint for developing complete life-event models that provide a citizen-friendly integration of public services.

4 Discussion and Final Remarks

Based on the reference models found in the literature, we proposed three basic types of WHAT life-event reference models. *General life-event reference models*, which cannot be directly related to any proposal made in the existing literature on reference models in the public administration domain. However, the examples discussed above on models that explore phases of electronic public services delivery, provided an excellent basis for development our general life-event reference model. *Cross-country reference models* for a specific life event is novel and does not directly relate to any reference model in the public administration domain previously proposed in literature. *Generic reference models* for a specific life-event are also original contribution and up to our knowledge have not been proposed in literature before.

Fig. 4 depicts the relations between the three types of reference models and their relation to life-event models. On the top of the chart there is the general life-event reference model presented in Section 3.3. Domain experts can specialize or instantiate this general model and define a cross-country (or cross-region) life-event reference model (Section 3.2). Given this model, domain experts in a specific country can develop a country-specific (but still generic) life-event model that covers many possible citizen circumstances and combinations thereof. Finally, the final step of instantiation or specialization is necessary to tailor these generic life-event models to specific circumstances of the interested citizen (see Section 3.1). This final specialization step is simple and a software component of an active-portal platform can perform it at run-time. The result of the specialization is a life-event model (a workflow) that corresponds to citizen special needs and interests. Although there is a clear correspondence between the hierarchy of models in [8] and the hierarchy of reference models proposed in our paper, the focus here is on integrating many public services and not on modelling individual ones.

Note also that there is a trade-off between the generality of the reference models and their usability. The most specific reference models at the third level of the

hierarchy in Fig. 4 are easiest to understand and use. We can easily write a software agent capable of tailoring them to citizen specific circumstances. On the other hand, the more general reference models, presented in the paper are much less prescriptive and therefore more difficult to use. Domain expert well experienced and familiar with public services provided in the country or region should use them to build specific life-event models. Building software agents to automate this task would be to ambitious at this point, since we first need to formalize the additional knowledge necessary for building models and then add it to the reference models developed here. Extended reference models would represent a proper life-event modelling ontology that would let us develop software agents for automated modelling of life-events.

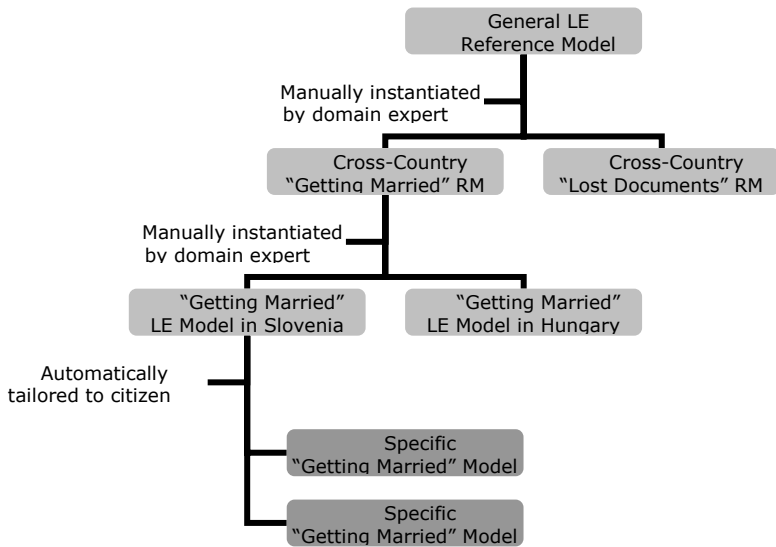


Fig. 4. The relationships between the three types of life-event reference models

There are other candidate types of life-event reference models, we have not included in our study. These include thematic reference models that can be used to model life events in a certain area of public administrations, such as personal matters, taxes, social security, or entrepreneurship. Such reference models can be country-specific, cross-region or cross-country. For building such models, further modelling efforts are necessary in order to collect a number of life-event models from a specific area and generalize or aggregate them in a reference model.

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An Architecture of Active Life Event Portals: Generic Workflow Approach*

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Abstract. Life event portals are considered as the core element of the overall e-government software infrastructure. Active life event portals are the most advanced incarnation of such portals able to process concrete life events related to specific citizen needs. Despite several realisation of 'supposed to be' active life event portals, there is still a challenge how to design such portals to: a) assure their flexibility, b) easy integration with existing e-government infrastructures, c) be compliant with the law regulations, d) apply well defined SOA standards and existing components.

As a step forward to satisfy the above requirements, we propose an architecture for active life event portals based on generic workflow approach. This SOA based architecture benefits from the most promising technologies and is compliant with the recent relevant standards. A first verification of this architecture has been done in the EU OneStopGov project aiming at implementation of the one-stop government concept.

1 Introduction

One of the biggest problems of e-government, which surfaced in most surveys carried out over the last few years, is a big gap between the supply and demand sides of e-services ([6], [8]). In addition, surveys focusing on the demand side, i.e. citizens expectations and satisfaction demonstrate that in order to narrow that gap we need to provide public services in a more **integrated, user-friendly and personalised** way. We firmly believe that there are three key concepts i.e.: concept of 1)'life events'; 2)'one stop government' and 3) concept of an 'active portal' integrated in a unique architecture of an active life-event portal which can provide the right solution for the problem. All these three concepts have been already widely discussed ([3], [9], [11]) and recognised as key elements of efficient e-service provision however not yet realised in an integrated portal architecture.

Life-event portals are basically understood as portals ([4]) which provide public services organised and integrated according to the 'real-life' situations like 'getting

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married' or 'establishing a business' in which citizens or business need relevant public services in order to comply with legislation. With some simplification, the most of current public portals fit into a group of so called 'passive' life-event portals. These portals provide standardised services that are not tailored to a specific user circumstances. In this sense an important step forward represent so called 'active life-event portals' ([11]) developed on a knowledge-base approach.

The key advantage of an active life-event portal is in its ability to lead an intelligent dialogue with the user and, on the basis of concrete user circumstances adopt provision of services to its current needs. In order to realise this concept we need architecture of a portal platform that is conceptually and technologically much more advanced in comparison to the most such platforms available today. Conceptually this architecture should provide functionalities for managing **generic life event models** which have embedded knowledge on all possible user circumstances on the one hand and on the other functionalities to **manage workflows** for execution of selected life events (referred further to as LEs). Technologically the platform should provide that during execution (in the run time) on the basis of specific user circumstances for each LE instance a **specific workflow** (an instance for each LE) will be generated and provision of services adapted to a specific user needs. Nevertheless this architecture should provide all other 'standard functionalities including authentication, payment, security etc.

Our paper presents an architecture for active life event portals based on generic workflow approach. This approach combines and benefits from two modern technologies, namely workflow management and rule management. More specifically, life events are defined as workflow processes while the dynamic elements of the life-event definition are expressed as rules. By following this approach, it can be argued that the flexibility of rules mechanisms is driven (controlled) by process definitions. That makes the approach applicable to real life events. In the contrast to the other existing architectures the proposed architecture aims at reaching four goals:

- assure portal's flexibility (e.g. via management of life event reference models, not just concrete citizen's cases), openness (e.g. via ability to tailor the individual components of the portal) and maintainability (e.g.. via clear separation of presentation and logic layers, various options to install service coordination layer),
- easy integration with existing e-government infrastructures (e.g. via using existing portal components for user and identity management, public key infrastructure, and payment services),
- be compliant with the European law regulations especially in the area of security management (e.g. secure connection, log in using smart cards, appropriate access to sensitive data),
- apply well-defined existing standards and components in the area of SOA, J2EE and web services (e.g. BPMN models, BPEL definitions, verification of non-functional parameters such as deadlines via SLA documents and using WS-Agreement).

In addition this paper also describe pros & cons of the proposed architecture that have been identified during verification of the first prototype implementation. This implementation has been done in the OneStopGov (www.onestopgov-project.org) project, its 1st development phase.

The rest of the paper is organised as follows. The work related to life event implementation and life event portals is described in section 2. Section 3 describes in details the approach to implement life events based on generic workflows. The architecture for active portals that would support the generic workflow approach is presented in section 5. This section also describes the main functionality of such portals using four different perspectives. Section 5 summarises the results of the prototype implementation. Section 6 concludes the paper.

2 Related Work

Life events (or life situation) have been used by a number of public sector portals at all levels as a guiding metaphor at the presentation layer. An example at the transactional level, is the European portal Your Europe (<http://ec.europa.eu/youreurope/>) where information to citizens is provided according to the situations such as those related to living, working, travelling, education and study etc. An example at the national level is the official portal of Austria (<http://www.help.gv.at/>) that is actually a pioneer in using life event and provides content according to events such as marriage, starting a new business etc. Furthermore, the Hong Kong ESDlife portal allows citizens to select the suitable life event from a long list (http://www.esd.gov.hk/life_event_index/eng/default.asp). A large number of city councils, especially in the UK, organize their services also around life events e.g. Southampton (<http://www.southampton.gov.uk/people/lifeevents/default.asp>), Salford (<http://www.salford.gov.uk/living/life-events.htm>) etc.

Although life events have been extensively used in practice and there are many public portals that are considered to be conceptually life-event oriented we are still at the very beginning of systematic studying, modelling and implementing the life event concepts and architectures of life event oriented portals ([1]; [2]). Even less have been studied architectures of active life-event portals ([4]), which are at the centre of this research.

Currently, in addition to the OneStopGov project which results on architecture are described in this article, there is a couple of another EU projects that, at least partially, are also focused on implementing life event concept, define an architecture for active life event portals and, finally, develop the portals.

The **Advanced eGovernment Information Service Bus (eGov-Bus)** project (www.egov-bus.org) aims at developing an e-government platform that will implement a software environment providing user-friendly, advanced interfaces supporting “life events” of citizen or enterprises. In eGov-Bus the life event implementations are represented as workflow processes. These implementations are defined by so-called workflow process description generator (WPDG) based on the domain ontology pertaining to a “life event” class presented to the system by a citizen. Existing natural language technologies will be integrated into the WPDG environment, both supporting the full text categorisation facility as well as providing the speech recognition/generation functions.

SemanticGov project (www.semantic-gov.org) is another project that aims at providing integrated public services to citizens at the national and panEuropean level

with the use of emerging semantic web technologies. In semanticGov life events are composed automatically on the basis of public service descriptions that are given in Web service Modelling language (WSML). The architecture proposed by SemanticGov is based on the Pan-European E-Government Services (PEGS) and uses concepts and technologies related to Web Service Modelling Ontology. The PEGS infrastructure includes ([11]) service requestor, front-office application, application layer and service providers. The application layer includes such modules as Service Discovery, Service Composition, Data mediation, and Process mediation.

3 Generic Workflow Approach to Life Events¹

Life events are just metaphors to group together public services according to citizens needs. Indeed, public authorities do not provide life events; they rather provide public services. Therefore, a life event can be only defined in terms of the public services that it contains. For example, the life event “*getting married*” contains the public services “*issuing a marriage permit*”, “*performing marriage ceremony at city hall*”, and “*registering marriage*”, which should be invoked one after the other. In the case of some life events (but not all) the exact public services that are included depend on the citizen’s circumstances. As an example we consider the life event “*travelling abroad*”. Depending on the nationality of the citizen and the destination, this life event should or should not include the public service “*issuing a visa*”.

Furthermore, a closer look at various public services suggests that each one has a number of versions (or variants) depending on citizen’s circumstances. For example, the public services “*issuing a marriage permit*”, includes, amongst others, the following versions “*issuing a marriage permit [if one partner is a minor]*”, “*issuing a marriage permit [if one partner is an alien]*”, “*issuing a marriage permit [if one partner is a divorcee]*” etc. In all cases however the output is exactly the same i.e. the *marriage permit*.

Finally, the citizen’s circumstances may also affect the actual service provider. This is particularly true for public services provided at the regional and local level. For example, all local authorities normally provide „issuing a marriage permit” the same service; the exact service provider depends on the citizen’s place of residence.

As can be seen from this description a life event can be represented as a generic workflow of public services. However taking into account profile and circumstances of individual citizens LE instances consist of sets of services versions. Determining the exact workflow for each LE instance can be done using a two-phase methodology.

Phase 1. From needs to services: In this step the citizen’s need is analysed taken into account the citizen’s profile and circumstances. As a result, a set of services is determined. This set is expected to fulfil the citizen’s need. This set of services normally constitutes a workflow in the sense that there is an order (or dependencies) between the services. This workflow of services may be different for citizens that face the same need based on their profile and circumstances.

¹ In previous research it has been suggested that the use of generic workflows is suitable for implementing life events ([5]). The main points of that work are presented here for comprehensiveness.

Phase 2. From services to instances of LE: In this phase, each public service is examined vis-à-vis the profile and circumstances of citizen to determine the public service version that should be invoked and the precise service provider.

Since life events are considered as workflows of public services, it seems appropriate to use workflow management technologies to implement life events. This technology treats life events as workflows (processes) and executes them according to their definition. Within a life event, a public service is represented as a composed activity (or sub process) while a service version is represented as an atomic activity. The order among services is represented by transitions. Circumstance and eligibility checks are represented by control flow elements such as split and join operations and transition conditions. Furthermore, the extension of workflow management with rule management features might be needed to accommodate advanced requirements such as advanced mechanisms to retrieve data, advanced time management, identification of required input documents, handling of citizen's profile etc. This leads to the suggestion to implement life events using generic workflow.

Generic workflows aim at increasing workflow process flexibility and adaptability in order to cope with the complexity of process versions, as well as with dynamic and evolutionary changes. To achieve these objectives, generic workflows suggest including dynamic rules in the process definition. The term "dynamic" means that the rules are validated at execution phase (and also during simulation) but not at the definition phase. Usually dynamic rules are used for the definition of transition conditions, selection of invoked services, and extraction of data from various (external) resources.

4 Architecture for Active Life Event Portals

From the 'bird view' an active life event portal can be seen as a kind of mediation layer between citizens and public authorities. As was stated earlier, the main goal of this layer is to organise public services provided by public authorities in the way they can together satisfy citizens' needs. In order to do that, the portal has to provide three main functionalities (see Fig.1 – use cases marked in green): a) implementation of life events on the basis of existing public services, b) realisation of life events instances for citizens' cases by identification of citizens' circumstances and using their profile data, involving all necessary public services and organising all required data and documents. Functionality a) is implemented in most Life Event oriented Portals, while functionality b) is specific to architecture of an Active LE portal.

Citizens and representatives of public authorities are the main groups of stakeholders of the portal. In addition, because of different expectations from the portal, representatives of public authorities may be further divided into two groups: **domain experts** and **IT experts**. The former experts manage (i.e. model, monitor, improve) life events at the conceptual level while the latter experts are responsible for their implementation and maintaining.

The consecutive sections introduce architecture of active life event portals. To show different aspects of this architecture it is presented via four perspectives, namely functional, data, technological and security ones.

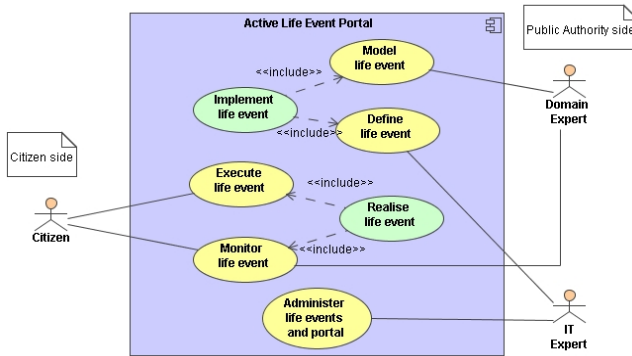


Fig. 1. The main functionality of active life event portals provided to their stakeholders

4.1 Functional Perspective

Active life event portals may be considered as a part of **government portals** or **front-office systems**. Since life events are (technically) defined as processes composed from public services, such active life event portals need to include a service coordination layer, which assure proper communication (i.e. invocation & monitoring) with those services. The main aim of this layer is to enable active life event portals to use just one coherent and unified method for service invocation and monitoring. The service coordination layer manages all the technical aspects, such as communication protocol, data exchange formats and secure transmission.

In our approach the active life event portal together with the service coordination layer are called **OneStopGov platform**. In order to make terminology coherent we also call the coordination layer as **OneStopGov Middleware**. Electronic public services are provided by individual public authorities. These services may be available directly via public authorities front-office systems or provided by public authorities back-offices. In the latter case, in order to assure secure and reliable communication between the portal and a back-office, the OneStopGov Middleware has also to be installed at the public authority side as a trusted application. In addition, if services provided by a back-office are related with a legacy system then some additional wrappers to opaque that system with appropriate communication mechanisms are required. All these three options are presented in Fig. 2.

The public interfaces provided by OneStopGov platform and its components are presented in Fig. 3. **LE implementation** provides methods to implement life events and manage their definitions. Using this interface it is possible to model and detail (define) a life event. A defined life event may then be verified, published and enabled for being instantiated.

Service Registration & Discovery integrates public services via registration mechanism and allows them to be searched in order to do dynamic service binding. **User Management** is responsible for managing portal users. It allows portal users to be registered, change their profile data, and assign appropriate notification mechanism. **LE Selection** provides functionality to retrieve a collection of life event definitions available for a LE user (e.g. all life events that are available for a citizen of age under

18 years). **LE Concretisation** is responsible for gathering information about the user (also from his/her profile) and finding appropriate combination of service variants that satisfy the user’s needs. **LE Execution** executes an instance of life event with all the documents provided by the user. **LE Administration and Monitoring** is responsible for monitoring and administration of life event instances.

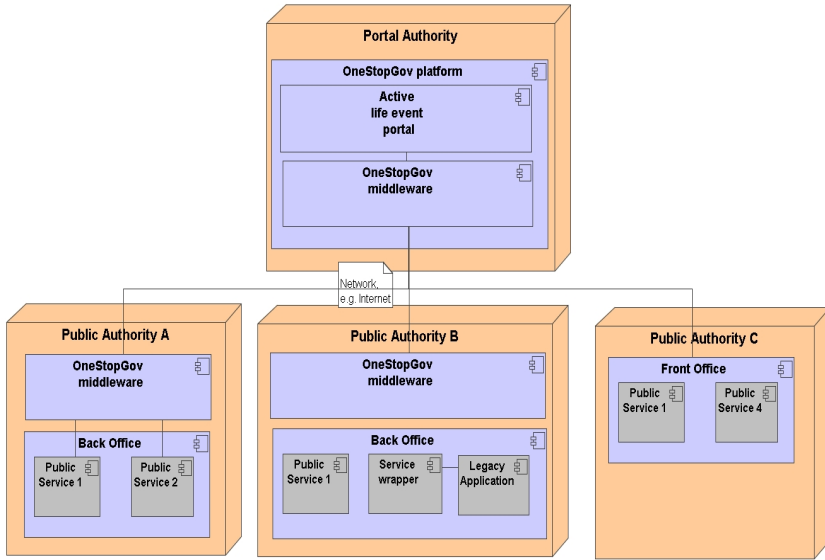


Fig. 2. Environment of active life event portals

Moreover, the structure of an active life event portal is compliant with the Model-View-Controller (MVC) concept where the system logic is clearly separated from presentation and control. As the result, the portal consists of two subsystems: **OneStopGov Façade** and **OneStopGov Engine**.

OSG Façade implements control and presentation layers of the OSG platform. It is responsible for providing all functionality of the LE portal to end users via user interface. The subsystem includes user management software component to manage portal users (authentication, authorisation, profiles). OSG Engine is responsible for providing the main functionality of the portal in terms of programming interfaces (business logic). This functionality is available to the end users via OSG Façade, which also manages information about the portal users and their profiles. OSG Engine provides the main functionality of the whole portal such as life event implementation and life event enactment.

The name and the meaning of interfaces provided by this subsystem are the same as for the public interfaces provided by the whole OSG platform. However, the input parameters of the methods included in the interfaces are extended of information about the users who call a given functionality. In that case, all necessary authorisation checks as well as the user session context are maintained only by the OSG Façade, not OSG Engine.

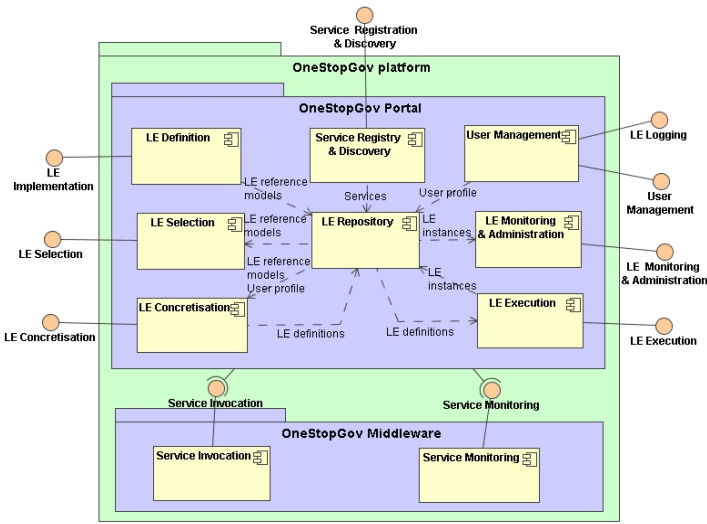


Fig. 3. OneStopGov platform

4.2 Data Perspective

The second crucial aspect of the overall architecture is related to data (exchange) formats. These formats are used for communication between the portal and the end users, as well as among the portal subsystems (and their software components).

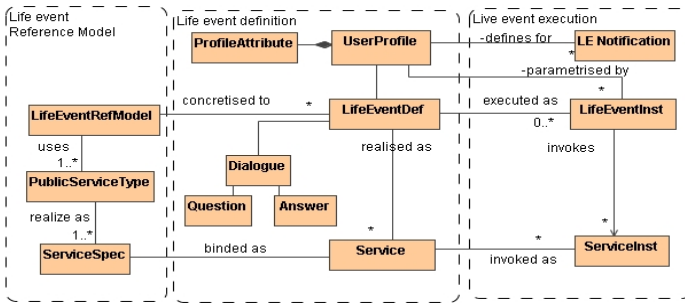


Fig. 4. Three basic representations of life events

There are three basic data formats to represent a life event at different stages of its life cycle (see Fig 4). A complete specification of a life event including required services (types) and their variants (concrete services) is represented as a **life event reference model**. This model is then used to identify a composition of services that are able to satisfy user’s needs taking into consideration information about the user (e.g. its age, address, nationality, etc.). This information may be provided in the **user profile** or entered by the user during direct dialogue with him/her. The identified composition is represented as a **life event definition** and may be considered as a reduced

(concretised) life event reference model. Such definition may be used by a citizen to start its life event with required documents and other necessary data (e.g. identity number). Information about the executed life event is represented as a **life event execution**. It includes basic information about the life event instantiation (start, finish) as well as invoked public services (start, finish, input, output).

4.3 Technological Perspective

From the very beginning, the architecture of the proposed active life event portal aimed at applying well defined and useful SOA standards, especially in the area of business process and web services (see Fig 5).

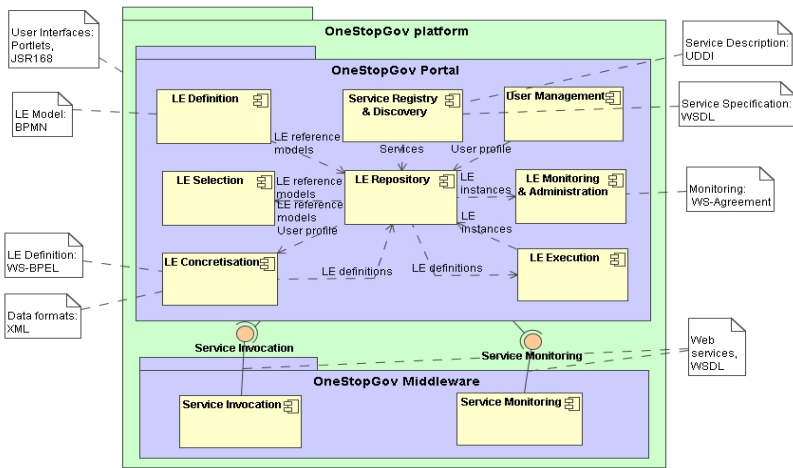


Fig. 5. Technological perspective – standards supported

In particular, the life event reference models are modelled in Business Process Modelling Notation (BPMN). Their definitions are expressed in Business Process Execution Language for Web Services (WS-BPEL). The public services are specified in Web Service Description Language (WSDL) and handled by a Universal Data Description Interface (UDDI). QoS parameters are verified using SLA documents expressed in WS-Agreement standard. The whole communication between the Portal and the Middleware is done via web services. Finally, the user interface is defines via portlets using Java JSR-168 standard.

4.4 Identity Management/Security Perspective

In government portals identity management, privacy of data, security and compliance with law regulations are one of the most critical features. In order to assure them several mechanisms on proper authentication, secure data, and secure communication have been proposed. **Authentication** of the users is carried out by the portal and User Management component. This component may cooperate with a security module that is external to the OSG platform (e.g. a directory server that supports LDAP) or is built in the portal soft-

ware (e.g. Apache server). User management component may authenticate a user either via standard login/password or using an electronic signature stored in a microchip card. The latter way of authentication follows the Directive 1999/93/EC on Electronic Signatures.

In the portal two types of user data are considered: **basic data** and **sensitive data**. The former data are stored in the user profile if the user agrees to store them (if not, he/she has to provide them any time they are required). An example of such data is the citizen personal identifier, which is the starting point, form most of other data related to the citizen and stored in public authorities databases. The latter data, because of law regulations, cannot be stored in the user profile. From that reason, they are read when they are required by individual public services. In addition, the results of life event execution may be stored in the user profile if the user agrees to store them and they are not sensitive. The above mechanisms aims at being compliant with Directive 1995/46/EC on Data Protection (section VIII) and Directive 2006/24/EC on Data Retention (Article 7).

Communication between the citizen and the portal may be done using HTTPs/SSL mechanisms. In case of invoking services located in a back-office, OneStopGov Middleware has to be a certified application. In addition, communication between Middlewares (localised at the public authority and the portal) is done using HTTPs/SSL. Finally, the documents provided by citizens may also be signed using a qualified private key. In that case, the documents are checked before execution of the life event if the signatures included are valid. The described mechanisms aim at being compliant with Directive 2002/58/EC on Privacy and Electronic Communications.

5 Prototype Implementation Results

The architecture described in the previous section has been initially implemented in OneStopGov, a European Commission co-funded project ([7]). At the moment this implementation has been initially verified against four life events proposed by public authorities from Slovenia, Hungary, Poland and Romania. The crucial benefits and main open issues observed so far are described below.

As the main benefits it may be stated that the architecture **supports well the onestopgov approach** based on generic workflows. In particular, LE concretisation component allows the portal to carry out an interactive dialogue with a citizen and determine his/her specific case. Secondly, using of standard components known from SOA as well as standard languages and data exchange formats made the **architecture open and flexible**. Thanks to this, individual components may be realised by different tools available on the market (also open sources). For example, life events may be modelled using any BPMN tool. In addition, the **architecture may be easily extended** of new components. An example is a more advanced dialogue mechanisms that use AIboot technology. Moreover, clear separation portal logic layer from the presentation layer gives opportunity to use **programming interfaces of the OneStopGov platform also by automatic agents** (non human) that would work on behalf of citizens (future). Finally, separation of service coordination layer from the portal together with appropriate support for secure communication allow public authorities to set up an **accepted way of integration with existing back-office systems** (also legacy applications).

On the contrary, we observed that **development of service variants** instead of providing one service with optional sections on the required documents. It seems that at the moment very few public authorities think about service variants and to change this proper 'teaching process' needs to be carried out. In order to cope with this risk we work on practical guidelines for domain /IT experts how to implement life events. Secondly, the architecture needs to put **more focus on life event ontology**, which seems to be crucial for providing required information by citizens without mistakes and to define more advanced relations between life events. An example is a list of possible values for specifying the place (i.e. cities) where your new business will be set up or to define more levels of life event categorisation in order to simplify their presentation to citizens. In order to cope with this risk, we plan to introduce in the second version of the architecture a separate component for life event ontology. This component would include ontology on life events (more advanced descriptions, categorisations, relations between life events), user profile attributes (default values, list of possible values – dictionaries, verification rules), public services (category of service, forms for attributes of the service). Finally, we also observe that many of **public authorities do not have electronic services** at all. For those authorities propose active life event portal as a knowledge portal that helps getting proper information about the data and documents required to process my concrete case (not just a general one).

Considering other EU projects on life events, the architecture proposed in this article tries to combine two worlds – well defined and existing web technologies and life events. From that reasons the components defined within the architecture are related to life events not to workflow management or semantic web technologies. Instead, these technologies are used for implementation of these components. In addition, the proposed architecture seemed to underline the meaning of user profile in finding concrete case of a given citizen. That seems to be crucial in one-stop government approach. Finally, also the part related to the dialogue with citizens in order to find his/her concrete case (i.e. life event concretisation) seems to be more advanced and detailed.

6 Conclusion

In this paper we presented an architecture for active life event portals based on generic workflow approach.

In contrast to the other architectures this one a) eases integration with existing e-government infrastructures (see integration perspective), b) is compliant with the main law regulations especially in the area of security and data protection (see identity management/security perspective), c) apply well defined existing standards and components in the area of SOA, J2EE and web services (see technological perspective), d) assures the portal flexibility, openness and maintainability (see all perspectives). Together with presentation of the architecture we also included discussion of pros and cons based on the results of the prototypical implementation and verification about four life events within the OneStopGov project.

As the next steps we plan to do the second phase of prototypical implementation of the active life event portals. This implementation will focus on monitoring of life events, administration of the portal and coping with exceptional situations. In particular, it will

provides mechanism for a) visualisation of life event execution (a chance to understand by a citizen what was done with his/her life event, what is the current state, what is planned to be done), b) notification of citizens about completing their life events, c) more user-friendly administration of services, life events and user profiles.

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E-Government Services Composition Using Multi-faceted Metadata Classification Structures

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Abstract. The connectivity generated by the Internet is opening new opportunities in service delivery since administrations are forming online alliances in order to deliver integrated value-adding services. However, due to lack of a step-by-step method for identification and further processing of services, the development of such composite e-Government services is usually ad-hoc. In this paper, we demonstrate how a systematic service composition can be accomplished: with the help of the proposed Service Description Worksheet, the e-Government Services can now be classified, searched for and composed into larger groups. This goal-driven approach can be used to understand the needs of different organizations and to depict the various functional characteristics of the cooperative processes in a declarative manner, suitable for prototyping projects in the public sector. Applying this method in the context of the Greek e-Government Services Framework, various services have been analysed, populating the worksheet database and leading to corresponding process models.

1 Introduction

Services need to be interoperable in order to allow for data and information to be exchanged and processed seamlessly across different government offices and organizations. In this framework, governments from all over the world are looking for technologies to facilitate the monitoring and interoperation of their processes in order to improve the service delivery to citizens. According to the UN Report Benchmarking E-government: A Global Perspective, “Services are the public face of government” [1]. E-Government services effectively bring descriptions of lots of documents, services, people, systems, organizations and other resources together with the particular needs of an end-user and use that information to broker access to a subset of the network services available to that user in the government sphere. However, the monitoring of processes enactment and enforcement at the application level has not been adequately addressed [2]. Public Administration (PA) services knowledge is rarely provided in a transparent and structured form in order to support employees in the execution of operational routine processes. At the same time, employees do not possess the knowledge about the placement of their own tasks in an

overall process, as well as legal interdependencies and process and organizational relationships [3]. In terms of organizational design, a structured and transparent preparation of relevant information, about the processes' steps and their interdependencies each government service includes, is missing. Both PAs and citizens however can benefit from a standard conceptual model for describing public services and life events. PAs can obtain a shared description structure, thus production and management of government information are eased, while interoperability with other agencies is fostered [4].

Combining structural state reforms with the adoption of new technologies allows any Governmental mechanism to become more transparent and citizen-focused. To this direction, the Citizen Service Centres (or KEPs in Greek transliteration) [5] portal has heralded a new era for the Greek Public Services by transforming the way in which the public interacts with government agencies. The Citizen Service Centres portal handles approximately 1,000 Public Administration (PA) services. More than 200 organizations from Ministries to Municipalities and Prefectures are involved in the provision of those services and around 3,000 hundred documents are exchanged in their context. The Citizen Service Centres Internet portal receives over 9 million visits each month and its operation is supported by more than 1,000 Citizen Service Centres spread around Greece and linked together by an IP network. Huge amounts of statistical information were retrieved from the operation of the KEPs and were elaborated on during the present study. For instance, statistics report 3.001.038 citizens' requests concerning provision of 739 specific services that were addressed by the Citizen Service Centres during the year 2005.

A rich service metadata description mechanism has been generally recognized as one of the most critical requirements for achieving highly automated e-Government Services. In the field of metadata patterns, Dublin Core [6] and the United Kingdom's e-Government Metadata Standard [7] have delivered thorough metadata standards and schemes for network resources which though apply mainly to documents, electronic archives and public sites. Regarding other European e-Government Frameworks (SAGA [8], Danish IF [9], BELGIF [10]), adoption of the Dublin Core Metadata Schemas is generally observed without any additional customization to the services' needs. The Service Data Worksheet proposed in this paper comes to build upon the results of the aforementioned initiatives and aims to collect all the relevant to public services metadata. The Service Data Worksheet has the credentials to lead to automated service process design using BPMN (Business Process Modelling Notation), whereas it contributes in solving the problem of the Homogeneous Service Composition. During the present study, the Core 100 Services, as extracted from the Greek e-Government Framework's complete inventory of services, have been populated in the taxonomy of the SDW and guide the design of patterns that homogenize and generalize the complete list of services. The resulting overall populated taxonomy is maintained in the Services Descriptions Database, providing the mechanisms for creating, updating and modifying service descriptions-nodes as well as for querying the whole multi-facet tree.

Chapter 2 describes the Methodological Approach proposed in this paper and chapter 3 presents analytically the e-Services Taxonomy. In chapter 4 the proposed e-Services Taxonomy is applied to the case of a specific governmental service and in chapter 5 the extracted process model is introduced. Finally the conclusions are juxtaposed in chapter 6.

2 Methodological Approach

Electronic services are generally considered as the highly visible manifestations of e-Government progress. However, in order for a Public Administration to design and deploy really interoperable services, the need for conception of services and information exchanged under a single prism and for harmonization of cross-organizational services emerges. To this direction, a methodology based on literature review on Enterprise Architecture Frameworks [11, 12, 13] and other modelling methodologies [14, 15] is proposed and applied for the composition of the Core 100 Services in the Greek Public State. In particular, it includes the following steps, as depicted in Figure 1:

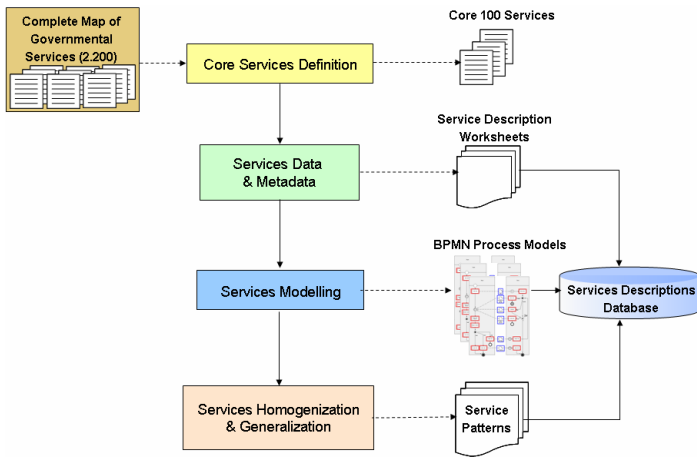


Fig. 1. Methodology for e-Government Services Composition using Multi-Faceted Metadata Classification Structures

Scope Definition. Since a lack of substantial amount of knowledge both in the service recognition phase and in the service methodical representation phase is observed in most cases, the definition of the complete list of governmental services is of crucial importance. Upon plotting the “Complete Map of Governmental Services”, the list of the Core Services needs to be explicitly set. The Core Services have been systematically chosen among 2,200 governmental services in order to constitute a representative sample of the services oriented towards citizens and businesses and embrace the majority of the Greek Public Authorities. Decisive factors in defining the Core Services list were: the services’ frequency, the services’ importance according to the European Commission’s strategic policy i2010 and whether these services are a prerequisite for other services.

Services Data & Metadata. The main objective of the present step is to retrieve and evaluate information for the Core Services under review. The information gathered is formularized in Service Description Worksheets (SDW), stored in a relational database (the Services Descriptions Database) that facilitates data processing and is appraised by a group of domain experts on the specific service. Using the classification provided by the SDW, a spherical view of the services to be deployed for citizens or businesses on a central and municipal level can be obtained, including

various service aspects such as the level of sophistication that can be achieved, the requirements for security, personalization and authentication and the means of service provision. The Service Description Worksheet which is outlined in the following sections also dives into details, such as the service execution steps, the exchanged documents among the involved parties and the business and legal rules guiding the service execution, and results in the design of service models. Such Service Description Worksheets can extend the scope of metadata schemes, such as Dublin Core [6] and United Kingdom's eGovernment Metadata Standard [7], to the description of services/processes.

Services Modeling. Upon filling in the Service Description Worksheet, all relevant details regarding the service execution can be easily extracted and depicted in process diagrams with the help of enterprise modeling tools. Business Process Modeling Notation (BPMN) [16] is considered as the standard notation for services modeling in the proposed methodology, since it creates a standardized bridge for the gap between the business process design and process implementation and ensures that XML languages designed for the execution of business processes, such as BPEL (Business Process Execution Language) [17], can be visualized with a business-oriented notation.

The Service Modelling Phase is designed to further distinguish between different description views that show particular points of view for understanding the service. Description views that have been identified within the proposed modelling methodology include:

- *Private Processes.* that show all the activities, which are performed within the service. The focus is set on as-is organisational process modelling, which means that activities like internal decisions or internal administrative work are also included. Such activities usually provide rich information on business rules that impact the service design.
- *Public Processes.* that show activities that are useful to understand the relevant service outputs and communication with an external entity. The significant process logic has to be indicated as well. Activities of the external entity are not described: the description scope ends with an indication about the exchanged document and message.
- *Collaboration Processes.* that show a consolidation of public processes for two entities/roles. Public activities of each role are being linked through messages and interactions are then visualized very easily. This view is the basis for recognizing the interoperability points among different public organizations that need to be automated exploiting the Web Services technologies.

Collaboration views including the detail of a Private Process view for all the involved parties are however adopted as the optimum representation diagram in the proposed methodology.

Services Homogenization & Generalization. Due to the large number of governmental services and the tremendous amount of scattered data concerning them, the issue of the Homogeneous Service Composition can be systematically addressed only with the help of a relational database system that stores the relevant service aspects and from which generalized Service Patterns can be extracted. Having dived into a great level of detail for modelling the Core Services and having obtained an aggregate picture of the Services in the previous step, the results are now consolidated in order to extend their scope to the whole Public State. In Greece, the homogenization and categorization

of the Core Services has led to Services Patterns which guide the implementation and evolution of the Complete List of Governmental Services.

3 The E-Services Taxonomy

In order to gather the necessary information to model the multitude of services provided by Public Administrations, a Service Description Worksheet (SDW) has been constructed and contains all the service-related information, aiming at the description of the service “as-is” without penetrating into “to-be” scenarios. There are 6 identified groups of facets for a service which are divided into sub-facets and have the purpose of describing specific characteristics of a service provided either electronically or conventionally in a methodological and coherent way that will facilitate the organization of the services into taxonomy. The objective of this taxonomy is twofold: to provide the means – based on its structure – for the systematic analysis of the contained services in order to deduct conclusions regarding, for example, the impact of the provided services and the required sophistication level, and to facilitate the service modeling with the help of an enterprise modeling tool. To this end, each facet that has been identified describes in a straightforward way certain defining features of the service, specifically:

- The **General Information** facet represents the generic view of the service. It includes fields, such as a) the *Service Code*, b) the *Service Title*, c) the *Providing Organisation*, d) *Involved Organisations*, e) *Final Service*, indicating whether the service is final or the delivered result is required as an input for other services, f) *Service Recipient*, g) *Service Nature* in the sense that it recognizes the basic template type the service is classified to (e.g. licence/certificate/registration/request/objection/payment/return), h) *Legal Framework*, i) *Self-appointed call of Service*, that defines whether the service could be called only with the acquiescence of service receiver or a public organization may call it automatically, j) *Information System support*.
- The **Conventional way of Service Provision** facet provides additional requirements posed to the service when it is conventionally provided. It consists of the following fields: a) *Requirement for Personal Presence at the submission of the application*, b) *Requirement for Personal Presence at the delivery of the service*, c) *Authentication Method*.
- The **Electronic Service Availability** facet states the main characteristics of the electronic service, in particular: a) the *Website URL*, b) *Means of service provision*, c) *Target Level of Sophistication* representing the level of service provision according to the four stages that have been adopted by the European Commission [18], d) *Service Personalization* e) *Service Usability*, which is set to levels according to the MIT Usability Guidelines [19], f) *Multilingual Content*, g) *Online/Offline Service Operation* indicating whether the service process can be accomplished fully online or the applicant can process it offline and then submit it, h) *Potential for XML file dispatch*, i) *Service Progress Review* referring to whether the applicant has the potential of reviewing the progress (status) of the service, j) *Authentication Method*, which identifies the requirements for user authentication and matches them to existing methodologies – e.g. basic authentication needs are covered

through User ID/Password infrastructures, k) *Security Need* matching the required security level for the transmitted data to the underlying technologies used – e.g. advanced security level through HTTPS/SSL.

- The **Service Implementation** facet depicts the service's workflow, including: a) the *Required Documents List*, b) the *Service Steps* followed for each involved organisation, c) the *Delivered Documents List* to the service recipient as proof of the service completion, d) *Differences from service template model* which describes the changes that exist in the flow of the service that differentiate it from the service template model (e.g. issuance of a birth certificate instead of issuance of a certificate), e) *Clarifying Information* about the service implementation.
- The **Service Importance** facet refers to the *Service Frequency* and the *Service Importance according to European Policies* (i2010) [18].
- The **Service Tracing** facet identifies the *Information Source* and the *Date of the Last Update*.

4 Populating the Multi-facet E-Services Taxonomy

A real world paradigm populating the proposed Multi-facet taxonomy has been drawn from the Services Descriptions Database and refers to the Greek VAT Statement Declaration. VAT Statement declaration in Greece takes place every 3 months. Citizens working as freelancers and businesses are obliged to submit their VAT Statement declaration and to pay or be credited the subsequent tax amount. The transaction can be fully automated with the use of TAXISnet [20] or can take place directly in the authorized Tax Agencies in the jurisdiction of which the liable to tax person or business belongs. TAXISnet (the word stands for TAXation Information System) is a set of electronic services for taxation accessible through the Internet to all citizens and enterprises in Greece.

Table 1. Example SDW for Periodic VAT Statement

General Information	
Service Code	G2B_099
Service Title	Periodic VAT Statement Declaration
Providing Organisation	Ministry of Economy and Finance, Tax Offices
Involved Organisations	Banking or other credit institutions
Final Service	Yes
Service Recipient	Businesses, Citizens working as freelancers
Service Nature	Declaration
Legal Framework	Law 2859/7.11.2000
Self-appointed call of Service	No
Information System support	TAXISnet, TAXIS (the tax-offices back-office system), DIAS (for e-payments)
Conventional way of Service Provision	
Requirement for Personal Presence at the submission of the application	Yes, for submission at tax office
Requirement for Personal Presence at the delivery of the service	Yes, for submission at tax office
Authentication Method	Demonstration of the (police) identification card

Table 1. (continued)

Electronic Service Availability							
Website URL		https://www.taxisnet.gr					
Means of service provision (i.e. Internet Browser, Mobile, Web Service, Telephone, ITV)		Internet Browser, Mobile Service (notifying submission dates)					
Target Level of Sophistication (i.e. Level 1 Information only, Level 2 One Way Interaction, Level 3 Two Way Interaction, Level 4 Full Case Handling)		4					
Service Personalization		Yes					
Service Usability (i.e awkward, bad, modest, good, handy, excellent)		Handy					
Multilingual Content		No					
Online/Offline Service Operation		No					
Potential for XML file dispatch		No					
Service Progress Review		Yes					
Authentication Method (e.g. None, Basic, Advanced)		Basic (Username / Password)					
Security Level (e.g. None, Basic, Advanced)		Advanced (HTTPS / SSL)					
Service Implementation							
Required Documents List	Document Title	Document Code	Compulsory	Observations	Officially searched	Issuance Body/ Organisation	Issuance Organization's Information System
Service Steps	Periodic VAT Declaration	G2B_109	Yes	-	-	Tax Office	TAXIS
	Service Viewpoint			Business / Citizen			
	Service Beginning Event			Every 1 or 3 months by filling in the VAT Declaration Form			
	Executed Process/Step	Next Process/Step	Transition from the executed process to the next process	Information System support	Required communication with external bodies	Existing Web Services for the communication	Supporting Documents List
	1. Fill in the VAT Declaration Form	2. Approval and Signature of the VAT Declaration	Directly	-	-	-	Periodic VAT Declaration
	2. Approval and Signature of the VAT Declaration	3. Check the VAT Periodic Statement's type	Directly	-	-	-	Periodic VAT Declaration
	3. Check the VAT Periodic Statement's type	4. Periodic VAT Payment	If the VAT Declaration is debit	-	-	-	Periodic VAT Declaration
	4. Periodic VAT Payment	5. Submission of the VAT Periodic Declaration	If the VAT Declaration is credit	DIAS	Yes, with a banking or other credit institution	-	-
	5. Submission of the VAT Periodic Declaration	6. Receipt of the Periodic VAT Declaration Submission Code	When a Periodic VAT Declaration Submission Code message is received	TAXISnet	Yes, with the tax office	-	Periodic VAT Declaration
	6. Receipt of the Periodic VAT Declaration Submission Code	7. Receipt of a Periodic VAT Declaration Acceptance Notice or a Periodic VAT Declaration Rejection Notice	When a Periodic VAT Declaration Acceptance Notice or a Periodic VAT Declaration Rejection Notice is received	TAXISnet	Yes, with the tax office	-	Periodic VAT Declaration Submission Code

Table 1. (continued)

Service Steps	7. Receipt of Acceptance Notice or a Rejection Notice	8. Check message	Directly	TAXISnet	Yes, with the tax office	-	Periodic VAT Decl. Acceptance Notice, Periodic VAT Declaration Rejection Notice
	8. Check message	-	If the Periodic VAT Declaration succeeded.	-	-	-	Periodic VAT Declaration Acceptance Notice, Periodic VAT Declaration Rejection Notice
		Return to step 1	If the Periodic VAT Declaration failed.				
	Service Completion Event			When the Periodic VAT Declaration succeeds.			
	Service Viewpoint			Tax office			
	Service Beginning Event			Receipt of a Periodic VAT Declaration			
			Transition from the executed process to the following process	Information System support	Required communication with external bodies	Existing Web Services to communicate with external bodies	Supporting Documents
	1. Receipt of a Periodic VAT Decl.	2. Issue Periodic VAT Declaration Submission Code	Directly	TAXISnet	Yes, with the Business/Citizen	-	Periodic VAT Declaration
	2. Issue Periodic VAT Declaration Subm. Code	3. Check the VAT Statement's type	Directly	TAXISnet	Yes, with the Business/Citizen	-	Periodic VAT Declaration Submission Code
	3. Check the VAT Periodic Statement's type	4. Cross-check Periodic VAT Statement	If the VAT Declaration is debit	TAXIS	-	-	Periodic VAT Declaration
	5. Accept Periodic VAT Statement	If the VAT Declaration is credit					
	5. Accept Periodic VAT Statement	If payment is settled					
4. Cross-check Periodic VAT Statement	6. Reject Periodic VAT Statement	If payment is pending or the amount paid is not correct.	DIAS	Yes, with banking and other credit institutions	-	-	
5. Accept Periodic VAT Statement	7. Send Periodic VAT Statement Acceptance Notice	Directly	TAXIS	-	-	-	
6. Reject Periodic VAT Statement	8. Send Periodic VAT Statement Rejection Notice	Directly	TAXIS	-	-	-	
7. Send Periodic VAT Statement Acceptance Notice	-	Directly	TAXISnet	Yes, with the Business/Citizen	-	Periodic VAT Statement Acceptance Notice	
8. Send Periodic VAT Statement Notice	-	Directly	TAXISnet	Yes, with the Business/Citizen	-	Periodic VAT Statement Rejection Notice	

Table 1. (continued)

	Service Completion Event	By sending Periodic VAT Statement Acceptance or Rejection Notice
Delivered Documents List	Document Title	Document Code
	Periodic VAT Statement Acceptance Notice	G2B_110
	Periodic VAT Statement Rejection Notice	G2B_111
Clarifying Information	The service presents differences between manual and electronic implementation. The transactions with banking or other credit institutions are considered as sub-processes and are modelled as separate services.	
Service Importance		
Service Frequency (e.g. High, Medium, Low)		Medium (every 3 months)
Service Importance according to European Policies		Yes
Service Tracing		
Information Source		Ministry of Economy and Finance
Date of the Last Update		6/2/2006

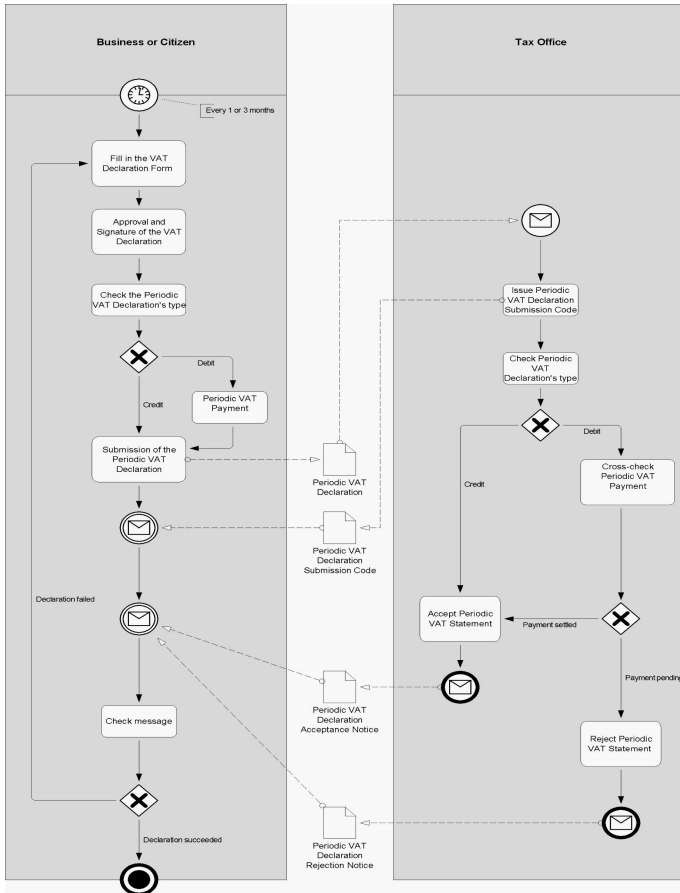


Fig. 2. Example Process Model for the Periodic VAT Declaration

5 Process Modelling Using the Multi-facet E-Services Taxonomy

With the help of the Service Description Worksheet, the necessary information for designing modeling diagrams is easily extracted, leading to a Collaboration Diagram, which reaches the level of analysis of a Private Diagram for each party involved to the service and complies with the BPMN notation, as depicted in figure 2.

6 Conclusions

The proposed methodology for e-Government Services Composition using Multi-Faceted Metadata Classification Structures aims to support the Central, Regional and Local Government to achieve resolution of the organizational interoperability and to systematically address the Homogeneous Service Composition problem. By populating the Service Description Worksheets, creating Service Models and storing them in a relational database - the Services Description Database, the composition of service hierarchies and the design of Service Patterns is facilitated. The proposed multi-faceted taxonomy besides allows for:

- Comprehension of public governmental services under a single prism.
- Homogenization and harmonization of the Core Governmental Services leading to Service Patterns which can be customized to the needs and requirements of any Public Administration.
- e-Government Services Modelling using the BPMN notation.
- Facilitation of e-Government service reengineering

Future steps along the proposed approach include formalization of the documents exchanged in the context of a service, of the information systems that support the service processing and of the Government Administrations that provide or are involved in a service in corresponding Description Worksheets. Further more, providing the entire taxonomy and query output in XML schema will allow for easier exchange of data in a universal format, further assisting the population and the extraction of results from the proposed taxonomy. Finally, upon designing the set of Service Patterns for the Greek Public State, lessons learnt and further guidelines on how to design, deploy and modify patterns will be issued.

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E-Government Field Force Automation: Promises, Challenges, and Stakeholders

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Abstract. With the growing pervasiveness and maturity of fully mobile and wirelessly connected technologies (FMWC), many organizations have begun to equip their field workforce with such information and communication technologies (ICT). The aim of these projects is to automate fieldwork operations, that is, to make them more effective, to improve field force responsiveness, and to speed up the field processes, while using resources and assets more efficiently. In both private and public sectors, such projects have been pursued, yet the specific promises and challenges are not deeply understood. We share early but already robust results from a multi-year research project, which studies the nature and interaction of organizational, social, technological, and human-actor related variables in local government field workforce automation, or short, field force automation (FFA). According to our findings, the ICT-based automation of fieldwork and field workforce appears as a far more demanding undertaking than other successful automation projects. However, the high potential for significant gains in productivity and fieldwork efficacy seem to justify a sumptuous and at times arduous adaptation process.

1 Introduction

In this article we refer to work in the field or fieldwork as a type of work being performed by fieldworkers, or the field force, outside the office, outside the plant, or outside a laboratory environment. Fieldwork under this definition has a wide range of instantiations, for example, equipment installation and maintenance, construction of any kind and of any order of magnitude, delivery of goods, in-situ services of all sorts, environmental scanning, site inspection, exploration as well as recovery of objects, surveillance, as well as emergency and disaster responses. What this incomplete list illustrates is fieldwork widely varies in kind and sorts. It occurs in contexts, in which management has limited control over important, mostly external variables. In contrast to controlled environments such as the office, the shop floor, or the laboratory, it also appears more challenging to support fieldwork with appropriate information and communication technology (ICT). With the advent of fully mobile and wirelessly connected (FMWC) ICT, field operations, it is believed, can now more readily expect to gradually grow up and into similar levels of ICT enablement, which

the back office, the shop floor, and the laboratory environments have enjoyed for a long time (Gorlenko & Merrick, 2003; Scholl, 2005; Scholl *et al.*, 2006).

Field Force Automation (FFA) based on FMWC ICT seems to promise significant gains in field force productivity and in the management of geographically dispersed assets. In the private sector, large service organizations such as General Electric and Sears employ tens of thousands of mobile workers in the field. Reports on early automation projects mention material gains in per-worker productivity, improved route management, and increases in service levels (Anonymous, 2006). In the public sector, significant productivity gains and also substantial cost avoidance have been observed in smaller scale projects (Bleiler, 2003). However, FFA also poses an array of complex and new challenges to managerial decision makers, the field force, and ICT staff and developers alike.

In this article we report on early and preliminary findings from a multi-year research project, which studies the nature and interaction of organizational, social, technological, and human-actor related variables in a local government FFA project at the City of Seattle's Public Utilities (SPU) unit. This study site provides a rich FFA environment thanks to Seattle's long track record of novel ICT utilization (cf., (Ho, 2002; C. Kaylor *et al.*, 2001; C. H. Kaylor, 2005)).

In 2001, SPU launched the *GoMobile* FFA project in its Water Operations Division (WOD). SPU leadership intended to give online access to backend databases and geographical information to crews and supervisors when working in the field. Also, work orders were to be dispatched online to workers in the field. As mentioned productivity gains and service improvements in that FFA project were so significant at WOD that SPU leadership hurried to expand the FFA into other SPU divisions (Bleiler, 2003). In fall of 2005, the *GoMobile* project was expanded to the Drainage and Waste Water Division (DWWD). However, while the FFA pilot was "straight-forward" (Newcombe, 2002, 2), the DWWD rollout proved problem-stricken from the outset. It appears that the pilot might have represented an ideal case. We began studying the FFA project shortly after the rollout at DWWD had begun.

Most studies look at projects involving an ICT component through a technology-centric lens. In our study of the SPU FFA project we employ a markedly different perspective, in which "the system" remains a "constraint" when working towards an end rather than an end in itself. Consequently, in our study we look at human actors rather than at "users" (Lamb & Kling, 2003). We have centered our research in a work and task domain perspective, which strives to connect human-actor-related, organizational, social, and technological aspects. The study intends to identify the main constraints (including ICT), under which the human actors perform their work. In this report, among others we highlight stakeholder relations as an important set of such constraints.

In the following, we first discuss FFA in light of the relevant literatures including our earlier findings. We briefly introduce our analytical framework and present our research questions specifying how stakeholder analysis relates to the other parts of this study. We then report on our results and discuss how those relate to our own and other findings recently gained in Computer Science research on FFA.

2 Literature, Theoretical Framework, and Previous Findings

In our study on FFA in local government: we have drawn on four streams of literature: (1) the (technical and non-technical) FMWC FFA literature, (2) the literature on organizational structuration, the (3) literature on cognitive work analysis, and the literature on (4) stakeholder theory.

2.1 Fully Mobile Wirelessly Connected Field Force Automation

FFA might ultimately head towards the ubiquitous computing model with high levels of both (environmental) embeddedness and (application/actor) mobility (Lyytinen & Yoo, 2002); however, for the time being and as reflected in the following review we see FFA emerge more strongly along the lines of the mobile computing model requiring only relatively low levels of embeddedness and context awareness. Also, while the boundaries may be blurred, below we distinguish between the non-technical and technical FFA-related literatures. Interestingly, though, the two literatures converge with respect to some major issues.

So far, the non-technical FMWC FFA literature has predominantly developed a number of analytical models and theoretical lenses (for example, (Al-Khamayseh *et al.*, 2006; Antovski & Gusev, 2005; Burja *et al.*, 2006; Chowdhury *et al.*, 2006; Feenstra *et al.*, 2006; Foghlú, 2005; Garg *et al.*, 2005; Gouscos *et al.*, 2005; Knopp, 2005; Sandy & McMillan, 2005; Schmidt, 2005; Sundar & Garg, 2005); however, comprehensive empirical studies using these frameworks have not yet surfaced in numbers. Strategically, some authors see FFA mainly geared at (a) fieldwork process improvement, (b) more instantaneous information sharing, and (c) field work/worker efficacy (Sheng *et al.*, 2005). With regard to FFA, fieldwork can be divided into two basic types (Scholl, 2005): (1) work that has existed before regardless of FFA (for example, solid waste collection), and (2) work that is new and made possible only by means of FFA (for example, on-site one-stop service to elderly citizens).

Hence, five FFA cases are distinguishable: (1) An existing type of work is improved or reorganized via a genuine FFA application, (2) an existing type of work is improved or reorganized via an adapted stationary application (adapted FFA), (3) an existing type of work cannot be improved nor reorganized via FFA, (4) a novel type of work emerges via a genuine FFA application (this is the truly innovative case), and (5) a novel type of work emerges via an adapted stationary application (adapted FFA) (Scholl, 2005). So far, most studies have focused only on case 2 FFA (existing/adapted), while reports on true innovation (cases 1 (existing/genuine), 4 (novel/genuine), and 5 (novel/adapted)) or on FFA inapplicability (case 3 (existing/unsuitable)) are still in short supply.

A 2004 Human-Computer Interaction (HCI) oriented review of seventy-two recent studies on mobile computing in the broadest sense found that most technical studies on mobile computing/FFA were dedicated to computer and interface architecture, while fewer studies dealt with aspects of implementation, use, and context (York & Pendharkar, 2004). Those studies found that FFA uses, contexts, and users expose a far wider variety and variability than known from traditional stationary ICT (see also (Perry *et al.*, 2001)). The needs of the field force also vary widely (*ibid*). Robust and versatile architectures and applications are far more challenging to design and build

for the FFA environment (*ibid*). FMWC technology, which requires lengthy training, or worse, disrupts the natural flow of and focus on fieldwork is likely to fail (*ibid*). The design of FMWC FFA applications and architectures, hence, needs to start with the specific resources and needs of the field force in mind rather than other aspects like managerial control or reporting (*ibid*). Other studies confirm the dependency of FMWC FFA success on addressing and emphasizing specific fieldworker needs, which via perceived usefulness and ease of use lead to workers' acceptance and actual FFA use (Wu *et al.*, 2007). Fieldwork occurs within multiple and changing contexts along the three dimensions of spatiality, social setting, and temporality (Henfridsson & Lindgren, 2005), which represent unique constraints on work and worker even on lower levels of embeddedness.

Context, in HCI terms "the location, identity, and state of people, groups, and computational and physical objects" (Dey *et al.*, 2001, 106), due to its inherent complexity and ambiguity has increasingly convinced system designers to consider cross-disciplinary research and design approaches to building FFA applications (Bradley & Dunlop, 2005). Still, when building context-aware (Dourish, 2001; Fischer, 2001; Grudin, 2001; Hong & Landay, 2001; Rittenbruch, 2002) FMWC FFA systems, designers might fall into a similar trap as in the case of workflow systems, many of which disregarded the situatedness and potential ambiguity of workflow states and sequencing (Greenberg, 2001). "People began to fight the system, for the system view of context (in this case the workflow context) did not fit with what was actually happening. It took some time for the community to recognize the problem, and even longer for commercial systems designers to accept the limitations of procedural workflow" (p. 264). According to the author, human actors need to maintain an easy control over automatic context-inferences provided by the mobile applications, otherwise they will most likely choose to abandon the system (*ibid*, also, (Bellotti & Edwards, 2001)). However, "building inappropriate context-aware software and hardware is already happening" (Greenberg, 2001, 265).

In summary, as a subsection of mobile computing, FMWC FFA faces both technical and non-technical challenges, which appear to go far beyond those known from traditional designs and uses of ICT in stationary environments such as the back office or the shop floor. Appropriately addressing and serving the work-related needs of fieldworkers seemingly plays even a greater role for FFA success than for traditional ICT uses. Frequently, however, pre-existing or otherwise inappropriate applications are pushed into the fieldwork environment, which do not sufficiently take into account the nature of the fieldwork or the context, in which the fieldwork occurs, leading to unnecessary disruption and ultimate failure of those systems.

2.2 The Integrated Structuration-CWA Framework

Human actors are more than merely at the receiving end of information systems or other technology (Orlikowski, 1992; Orlikowski & Robey, 1991), rather, they actively shape the instantiation of any technology artifact regardless of the artifact designer's assumptions and intentions (*ibid*). Basically a similar statement can be made regarding institutional settings (DeSanctis & Poole, 1994; Giddens, 1984): While those settings frame and constrain human actors' behavior, at the same time those very actors enjoy many degrees of freedom to interpret and actively shape those constraining settings in ways they wish (Orlikowski & Robey, 1991).

We have argued that beyond (1) the formal institutional setting, (2) the technology artifacts, and (3) the individual or organizational actor variables a fourth aggregate variable needs to be considered as an important interacting element, which we have referred to as the informal and social organization (Katz & Kahn, 1978; Scholl et al., 2006; Taylor & Van Every, 2000). We have further claimed that these mutually influencing variables can be studied without unduly reducing the complexity of their interactions by means of CWA leading to an *integrated structuration-CWA framework* (see figure 1). CWA distinguishes seven dimensions of analysis of (a) the environment, (b) work domain, (c) (formal and informal) organization, (d) work-domain-related activity, (e) activity related to decision making, (f) activity related to actor-preferred strategies, and (g) actor’s resources and values. The individual impact of the four aggregate variables as well as certain effects of their interaction can be captured within the layered seven-dimensional analysis which CWA employs. The resulting integrated structuration-CWA framework we find provides advanced analytical and explanatory power for understanding a complex organizational/socio technical phenomenon such as FFA (Fidel et al., 2007; Scholl et al., 2006).

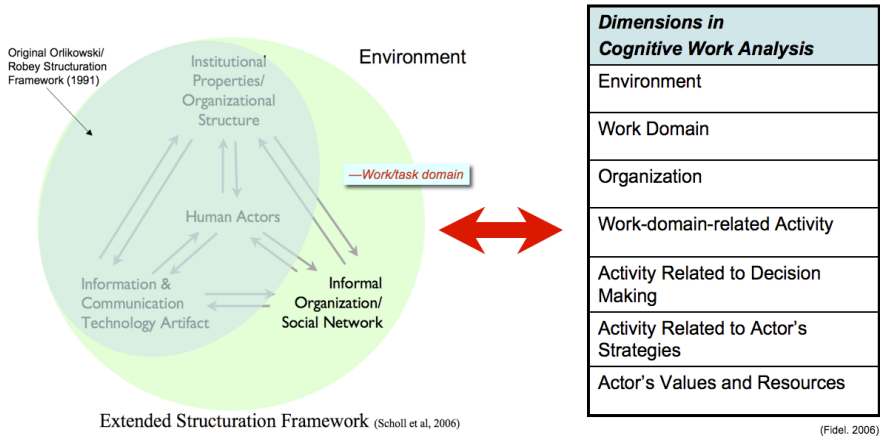


Fig. 1. Integrated (Extended) Structuration-CWA Framework

While CWA helps analytically distinguish the constraints exerted on an actor’s work in the various dimensions, the integrated framework puts those constraints into the context of the interacting variables. Or, put another way, the structuration portion of the integrated framework guides the cross-dimensional analysis of the constraints. In that capacity, it fosters the understanding of both ends of the analytical spectrum, the micro-level work analysis, and the mezzo-level aggregate variables, by explaining the interdependencies imposed on the former and by characterizing and qualifying the particular nature and influence of the latter. In summary and more generally, in doing so the integrated framework also provides an organizational platform for interdisciplinary research interested in theoretical contributions from other areas of academic knowledge.

Table 1. Summary of findings from first phase of research project (Fidel et al., 2007)

Research Questions	<i>Work/task Perspective</i>
What are the current constraints on the fieldwork?	(1) Work is initiated via work orders; (2) oriented towards preventive maintenance of assets; (3) consists of scheduled repair jobs, and (4) emergency handling; (5) high asset specificity and asset history, that is, asset-specific information required; (6) casual use of task lists and equipment lists; however (7) much information on assets and procedure is tacit or undocumented (color of water, smell, sound etc); (8) high degrees of situational decision making; (9) work is semi-structured with many variations and exceptions (task specificity); (10) detail complexity
How does the FMWC FFA influence those constraints?	1) Work order support via FFA system; 2) new asset and service management system; 3) new mobile application; 4) no information carry-over from old to new system; 5) no systematic training of all crew; 6) mismatch between FFA system and fieldwork flow; (7) work-related information missing; (8) information noise; (9) proposed procedures at times irrelevant; (10) system does not support situational decision making; (11) FFA system incorrectly assumes standard structure with little variation; (12) fieldworker frustration with FFA system considered useless
	<i>Organizational Perspective</i>
What are the current constraints on the fieldwork?	(1) Lack of leadership; (2) lack of organizational stability (frequent reorganizations); (3) scheduled job rotation partially detrimental to productivity and information sharing; (4) high training needs.
How does the FMWC FFA influence those constraints?	(1) Technology adaptation suffers from frequent leadership and directional changes; (2) FFA system does not support all organizational procedures; (3) drive-by inspection procedures not supported; (4) lack of sufficient FFA training
	<i>Social (Network) Perspective</i>
What are the current constraints on the fieldwork?	(1) Esprit-de-corps among field crew/crew chiefs; (2) long-term relationships due to multi-decade continued employment; (3) social network fills many gaps the formal organization has created
How does the FMWC FFA influence those constraints?	(1) FFA system widens the gap and creates enormous tension on the social network; (2) frustration about FFA system easily communicated through the social network; (3) some attrition observable due to this frustration
	<i>Human-actor Perspective; (2)</i>
What are the current constraints on the fieldwork?	(1) High work ethos and commitment to mission; (2) interest and willingness to learn new methods and tools; (3) feeling that leadership does not understand the nature of the job or is not interested in workers' view
How does the FMWC FFA influence those constraints?	(1) Growing frustration with FFA system; (2) lack of functionality and flexibility; (3) FFA perceived as a burden with no recognizable benefit to fieldwork or worker

2.3 Findings from the First Phase of the Project

Based on the integrated structuration-CWA framework we have begun to derive a formative model, which describes the work being done by the field workforce and

their contextual interaction (Fidel et al., 2007). In table 1, we briefly summarize our findings from the first phase of our FFA research project with the Seattle's SPU.

With regard to the type of FMWC FFA applications (Scholl, 2005), we found only adapted (type 2) applications at SPU, which assume very structured workflows rather than a lot of ad-hoc variance in task flow sequence as seems to be the norm in the division we studied.

2.4 Stakeholder Theory

While it has seemingly fallen out of favor as a central theory of the firm in its areas of origin (strategic management, management science) (Englander & Kaufman, 2004), stakeholder theory (Brugha & Varvasovszky, 2000) has made major contributions to the practices and theories of, for example, ICT project management (Boonstra, 2006; Pan, 2005), public administration (Tennert & Schroeder, 1999), and e-Government information systems (EGIS) (Scholl, 2001, 2004). The stakeholder perspective posits the thorough accounting for and adequate consideration of individuals and organizations, who "can affect or be affected by the achievement" (Freeman, 1984, 25) of an organizational purpose, goal, or project.

Stakeholder theory has been operationalized for analytical and practical managerial purposes mostly by distinguishing stakeholder *stance* (Blair & Whitehead, 1988) and stakeholder *salience* (Mitchell *et al.*, 1997). Stakeholder stance has been defined in a two-dimensional space of the potentials for support and threat resulting in four distinct cases (1) full support, (2) full opposition, (3) mixed (support/threat), and (4) indifference. Stakeholder salience has been introduced as a three-dimensional phenomenon of power, legitimacy, and urgency. Scoring models, which rank-order stakeholders along those dimensions of salience and stance, have been used in practice (Scholl, 2004) demonstrating a high accuracy in correctly identifying strategic stakeholders and their likely stances in EGIS projects. In the context of the integrated structuration-CWA framework, stakeholder theory helps identify salient influencers among the human actors and institutional groups and their likely stances relative to a problem at hand. Stakeholder theory might also help uncover stakeholder coalitions (Weible, 2007).

2.5 Specific Research Questions in This Phase of the Project

Our findings indicated that the stakeholder landscape was unclear (not only to us) and needed clarification for understanding important organizational and social network relationships with respect to the *GoMobile* FFA project, which led us to the following research questions:

- (R1) Who are the key stakeholders in the FFA project?
- (R2) What are their respective stances and alliances?
- (R3) How do the findings from stakeholder analysis match up with our earlier results?

Addressing these research questions we hoped would give us, the researchers, as well as the practitioners, valuable insights for further action and direction in research and practice.

3 Method

SPU field operations comprise some 200 staff and management. From our transcripts of ten completed case analyses at SPU we were able to identify individual and organizational stakeholders as well as various groups of stakeholders (for example, crew chiefs, influential fieldworkers, SPU management, etc.) along Freeman's definition (Freeman, 1984, 25). We checked our list with a number of individuals from various stakeholder groups for correctness and completeness. Our final list comprised 76 stakeholders. Stakeholders could be listed more than once due to different roles and responsibilities (for example, a unit manager could be mentioned in her functional role and also in her role as a member of the Steering Committee).

We developed an instrument, which listed all stakeholders by number and name. At the bottom of the instrument, we provided ample space for incorporating additional stakeholders. For each stakeholder, the instrument contained entry fields for "I know/I don't know that stakeholder," the rankings of power, legitimacy, urgency, potential for support, and potential for threat, and also for the participant's own confidence in her ranking.

Before we asked participants to perform the rankings, we went through the list of stakeholders, and asked them to add additional stakeholders to the list if they felt it necessary. Before participants were asked to perform the rankings, we introduced to them the ranking criteria and also provided lists with guiding questions for each criterion (Tennert & Schroeder, 1999). We then asked participants to use a 1-to-5 Likert scale for ranking stakeholders from high (=5) to low (=1) along the saliency, stance, and own confidence criteria. In case participants did not know a particular stakeholder or felt unable to rank a given criterion, they were asked to use a zero or a blank for that entry.

We used a purposive sampling approach for selecting participants (Ritchie *et al.*, 2003) and found four field operations managers, one ICT manager, two crew chiefs, and three crew members, that is, a total sample of $n=10$, who agreed to participate and perform the ranking exercise. Since crew chiefs are normal crewmembers that only temporarily assume the responsibility of a crew chief, we essentially had a 50-to-50 ratio of managers and fieldworkers in the sample. Completing the questionnaire took participants between 35 and 45 minutes. The ranking criteria seemed to be well understood. There were very few questions for further clarification.

We analyzed the results using descriptive statistics for both stance and saliency and grouped the results into three ranking buckets ("top 25," "midfield," and "bottom 25"). With the results of the stakeholder analysis in hand, we went back to the transcripts of our phase-1 interviews and re-evaluated our earlier insights.

4 Findings

While managers on average knew personally over 80 percent of the stakeholders, fieldworkers knew slightly less than 50 percent of the listed stakeholders. Only the managers added names of individuals to the list bringing the total count to 81 stakeholders. We incorporated those new names into the instrument used in subsequent interviews. Generally, participants had a good (=4) to high (=5) confidence in their rankings regardless of personal acquaintance.

According to all interviewees (both managers and fieldworkers), the *top ten salient stakeholders* relative to the *GoMobile* FFA project were identified as (1) the SPU management as a group, (2) the SPU general manager, (3) the FFA Steering Committee, (4) the project coordinator of the FFA Steering committee, (5) the SPU field operations manager, (6) the DWW division manager, (7) the City mayor, (8) the DWW division manager as a member of the Steering Committee, (9) the (technical) Project Team, and (10) the SPU field operations manager as a member of the FFA Steering committee. Except for the top 2 the standard deviation for the ranking of all other top 10 stakeholders was moderately to significantly higher indicating some variance in rankings. It struck us that all influential fieldworkers but one at DWWD were ranked in the bottom 25 regarding their saliency. Also in that low-ranking section we found the crew chiefs as a group, other City agencies, and the general public, that is, the ratepayers as dead last.

When comparing the rankings of managers with those of fieldworkers, we made the following discoveries: Managers' rankings had a higher cohesion (and lower variance) than fieldworkers' rankings. Managers ranked the top ten very similarly to the overall top ten salient stakeholders. Interestingly, managers without exception placed crew chiefs and influential fieldworkers (both individual and as a group) into the bottom half of their rankings; actually, crew chiefs as a group ranked 41, the highest-ranked crew chief made it to 51st rank, and the highest-ranked individual fieldworker had rank #56. Fieldworkers, in turn, while ranking the top five similar to their managerial colleagues and the overall results ranked two DWWD crew chiefs as rank #7 and #8, and all crew chiefs but one among the top 25 salient stakeholders. However, although they ranked influential fieldworkers in lower midfield as a group, as individuals all influential fieldworkers were ranked in the bottom 25. We were stunned to find that the fieldworkers ranked the FFA (technical) Project Team as well as individual project team members at the very bottom in terms of saliency.

With respect to stance in the overall rankings of both groups, managers and fieldworkers, we found high scores regarding the *potential for support* of the FFA project of many salient stakeholders and no high scores regarding the *potential for threat* with any stakeholder (salient or not). However, while the Project Team, the Steering Committee, and SPU management (both as groups and individuals) were ranked as very supportive, just a single influential fieldworker and a single crew chief fell into the top half of the support ranking. Moreover, the vast majority of the crew chiefs and fieldworkers scored relatively low in terms of support for the FFA project. Conversely, while the threat scores remained moderate (<4), crew chiefs and fieldworkers (as individuals and groups) vastly populated the top 25 of the threat-related rankings. Also, the City Council, the City Mayor, and SPU management appeared in the top 25 of the threat-related rankings.

When juxtaposing the support-related rankings of managers with those of fieldworkers, we made the following observations: Managers ranked similarly to the overall ratings regarding the top 25 and bottom 25 supporters of the FFA project. However, to managers the DWW crew chiefs as a group appeared much more supportive (rank #14) than to fieldworkers (rank #49), although the latter ranked some crew chiefs in top midfield of support. While fieldworkers ranked individual members of the (technical) Project Team high on support, to them the Project Team as group ranked near the very bottom of support.

“Mixed Blessings” (Blair & Whitehead, 1988) are those stakeholders with relatively high scores regarding both support and threat potentials. While those stakeholders may support the project under certain conditions, they might threaten it under different ones, and vice versa. For managers those individuals and groups might need the most attention and dedication. It came as no surprise that influential fieldworkers and crew chiefs (as individuals and groups) populated the list of mixed blessings in numbers.

With these findings in hand, we revisited both the transcripts of the cases analyzed before and the findings from that first project phase. It appears that planners and project team members spent little time with crew chiefs and fieldworkers to (a) understand the idiosyncrasies of the work at DWWD, (b) obtain input regarding the suitability of the new system before implementation, and (c) ask about specific needs and requirements of DWWD fieldworkers. Crew chiefs and fieldworkers uttered great frustration with not being heard before and during the implementation of the new system (“We knew it wouldn’t work but nobody wanted to listen.” “If they (management) only listened.” “The system actually does not support our work, it rather makes it more difficult.” “We are helping the system rather than the system is helping us”).

In summary, the findings suggest a major disjoint between key stakeholder groups of the *GoMobile* FFA project, that is, SPU management, the Steering Committee, and the Project Team, on the one hand, and crew chiefs and fieldworkers, on the other hand. Obviously, the project and unit leaderships have not managed to secure the support of the most immediately impacted stakeholders in the project, that is, the fieldworkers and crew chiefs. Upon checking the data from the earlier case analyses, we found ample support for this conclusion.

5 Discussion

The method used and the instrument employed helped identify and distinguish key stakeholders in the *GoMobile* FFA project (research question R1): the managerial group, that is, SPU management, the Steering Committee, the Project Team, and the field force group, that is, the crew chiefs, and influential fieldworkers are among the primary stakeholders of the FFA project. As said before, one challenge for the managerial group is to acknowledge the saliency of the field force group, which consequently needs to be reflected in an adequate involvement of the latter in setting the directions and specifications of the FFA project. So far, the disjoint between those two stakeholder groups has created disruptions in the project and frustrations for all groups involved; however, that situation has not escalated into an open conflict.

Regarding the stances and alliances (research question R2) the support levels of the FFA project among the managerial group are high, while they are low in the field force group. While the threat levels are very low for the managerial group, they are somewhat higher for the field force group. Overall the field force group exposes only lukewarm support for the project with a latent potential threat to the project at about the same levels. This represents an unstable and potentially dangerous situation for the project. Since the field force group comprises the human actors most affected by the project, this group’s willingness to support it is absolutely critical. Likewise, since the field force group is the one, which can affect the project the most, this group’s

potential to threaten the project is a very serious matter. Human actors can strand ICT projects in many ways, which may not even be noticeable by management (Checkland & Holwell, 1998), such that ignoring the field force group's concerns is not an option. On the contrary, project advocates need to proactively focus on mitigation of the threat potential, which could be accomplished via co-opting the field force group, for example, by involving them into the project-related decision-making process.

With respect to the match-up of findings with earlier results (research question R3) we found clear evidence that the field force as an entire stakeholder group has strong reservations against the FFA project. This reservation seemingly is not based on some sort of stubborn resistance to change. Our accounts show that the field force's frustration with the FFA system can be summarized as due to the (1) lack of appropriate FFA functionality, (2) lack of ease of use, (3) lack of added value/usefulness, (4) lack of flexibility, and (5) burdensomeness (in terms of fieldwork-unrelated extra tasks). Although mostly initiated via work orders, fieldwork at DWWD is semi-structured, situational, at times even event-driven, and variable in sequence with a high degree of ad-hoc decision making required on behalf of the field force. In other words, contrary to the inherent assumptions in the logistics and asset management system MAXIMO[®] DWWD fieldwork does not follow standard procedures, which are highly structured and highly invariable. Mobile MAXIMO[®] qualifies as a type 2 FFA application, that is, an adapted-to-mobile stationary application, which obviously represents a mismatch to the requirements of the fieldwork.

With introducing the FFA technology, SPU management pursued three goals: (a) improvement in the management of (aging) assets, (b) increase in field force productivity and efficiency, and (c) reduction in operating costs (Bleiler, (2003); Haskins, 2006). In order to achieve those goals, better field force supervision, more decentralized decision-making capability, and higher quality and timeliness of field force reporting was seen as critically important (Bleiler, (2003)). Consequently, a central prerequisite for reaching those ambitious goals was seen in gaining more central control and oversight over the field force via the FFA, which would explain why the field force had hardly been involved in the planning of the FFA project. However, it also discloses a certain degree of unfamiliarity with the nature of the fieldwork on part of the FFA planners who did not discover the structural mismatch between the actual work performed in the field and the FFA system workflows.

As said before, fieldwork can be distinguished from other work such as back-office work or shop-floor work along various dimensions. First, we distinguish task complexity and a related tacitness of knowing about the task and work object. While other work may involve relatively low degrees of complexity and tacitness, fieldwork has a wide bandwidth of low complexity to relatively high complexity regarding task and work object (see figure 2). FFA systems need to account for this situation, that is, traditional computing concepts, which

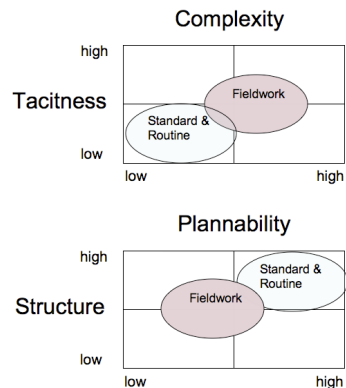


Fig. 2. Dimensions of Fieldwork

are context-unaware might have much lower utility in fieldwork than in other work contexts. Something similar can be said for two other dimensions, which distinguish fieldwork from other types of work, that is, fieldwork has also a wide span of structure from fairly well structured over semi-structured to lowly structured. This limits the potential for preplanning of fieldwork. FFA systems, hence, need to provide for flexible re-planning and ad-hoc changes of schedules and sequences. Also, field force has ad-hoc needs of information that may not be available in well-structured and pre-configured formats. Furthermore, the recording of major portions of relevant information may defy easy structuring and may rather require an open input format (including other than typing or hand-writing (Lutters, 2004)). Consequently, the access to such unstructured information may better be served via search-engine support than traditional database queries.

At our study site, we also observed another phenomenon, whose extent and importance we became more aware of than ever before, that is, with growing tacitness regarding a task or object it is harder to separate that specific task or that specific object/asset from the human actor who has intimate tacit knowledge about it. In other words, the management of highly specific assets or tasks misses the point if it does not take into account the specific human actors who hold important tacit asset-/task-specific knowledge. In such situations, we introduce and propose to use the terms of asset/human-actor couplets and task/human-actor couplets rather than assets or tasks in isolation.

We also explicitly relate our results to those from HCI research on context-aware applications and systems, which find very different challenges and requirements in building such systems than for stationary- or single-context systems. From the work-domain perspective we confirm the reports on frustrated and desperate human-actors and their particular reactions to systems perceived inappropriate and burdensome.

6 Conclusion

This study is still in progress, and many results are early or preliminary. However, some of those results are already pretty robust, and they correspond to, and even confirm insights from other disciplines (e.g., HCI). Fieldwork is a unique “mix of planned maintenance activities, scheduled construction, and unplanned emergency repair attending to trouble calls” (Bharman et al., 2006,2). The disruption of schedules and the rearrangement of priorities are other characteristics of this type of work (ibid). Tasks are highly specific, so are many assets and objects involved in fieldwork. Furthermore, over time fieldworkers accumulate high levels of idiosyncratic and tacit knowledge about tasks, task contexts, as well as work objects and assets. To emphasize this unique relationship we have introduced the terms of task/human-actor couplets and asset/human-actor couplets for further study. Supporting fieldwork by appropriate, that is, fully mobile, wirelessly connected, as well as work-, task-, and context-specific applications is very challenging to technology, process, and organizational designers. It appears that many early FFA projects fall into the “type 2” trap, that is, they rely on context-unspecific, adapted-to-mobile stationary applications as their first bet on FFA. This may be counterproductive in two ways: (1) It frustrates the field force and makes it less inclined to rely on FFA in their work, and (2) it may

equally frustrate decision makers, since investments into FFA appear as unjustifiably costly and ineffective. However, appropriate FFA systems may yield tremendous productivity and efficiency gains as some of the more successful projects in the private sector have already demonstrated. In future research, we intend to specify characteristics of successful FFA systems and successful strategies of their implementation.

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Where to Go in the Near Future: Diverging Perspectives on Online Public Service Delivery

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Abstract. Although the electronic government is under heavy development, a clear vision doesn't seem to exist. In this study 20 interviews among leaders in the field of e-government in the Netherlands resulted in different perspectives on the future of electronic public service delivery. The interviews revealed different objectives and interpretations of the presuppositions regarding citizens' desires. Opinions about channel approaches and 'trigger services' appeared to vary. Furthermore, the respondents didn't agree on the number of contact moments between citizen and government, had different opinions about digital skills, pled for various designs of the electronic government and placed the responsibility for electronic service delivery in different hands. Conclusion is that there is a lack of concepts on how to do things. Everybody talks about eGovernment, but all have different interpretations.

Keywords: e-Services, perspectives, strategy, policy.

1 Introduction

In the 1980's, the term New Public Management (NPM) was invented [1]. The focus of this management vision was on the relationship between governments and their citizens. The accent of the way governments influence their citizens shifted from reinforcement of the law towards service provision. A more service oriented approach would improve the relationship between citizens and governments. The impact of NPM was big. In the second half of the 1990's, most Western countries followed a strategy to improve their public services based on the ideas of NPM [2].

With the rise of the internet in the nineties, an important shift took place in the way the NPM vision was to be accomplished. For governments, it seemed that the ambition to become more citizen centered through the deployment of various different applications of ICT, finally became reality [2]. In the US, the National Performance Review encouraged governments to employ internet in order to improve service levels, cut red tape and make access to governments easier. In 2000, the Lisbon conference covered these topics and it was agreed upon that by 2010 Europe should be the most dynamic knowledge economy in the world [3].

Although ICT is seen as the means to accomplish the objectives founded in the NPM vision, research indicates that it isn't the Holy Grail in service delivery. The use of electronic services lags behind with the demand [4]. Lacunas in existing knowledge are identified and it is demonstrated that the internet is still not a general accessible channel due to the lack of the citizens' motivation, a lack of digital skills and a lack of possession of computers and internet access [4]. Also, the use of more traditional service channels, like the telephone and service desks, doesn't decline [5]. Despite these indications, the ICT-policy of the government is characterized by few barely funded presuppositions over what citizens want, how they use ICT and what the consequences are [6]. Due to these presuppositions, developments have led to an increased distribution of the internet, especially at the demand site. For further developments it is important to take sensible steps and make wise decisions on all governmental levels. This requires committed executive leadership [7]. However, although the electronic government is under heavy development, a clear vision of eGovernment doesn't seem to exist: it is too often considered a public variant of eCommerce [8]. In this explorative study different perspectives on future electronic public service delivery are identified by conducting 20 open interviews among leading figures in the field of e-government in the Netherlands. The next section covers the research background and the used methodology. Section 3 summarizes the interviews and in section 4 the conclusions are drawn.

2 Research Background

While enabling government services to be delivered online is a key target within most of the EU countries' strategies, there is no documentation of an eGovernment framework to guide the process. Guidelines for implementation are also missing from the literature [9]. The models that do exist are often wider than the context of eServices. They sometimes complete, but also exclude each other aspects. Investigating the relevant models and literature globally yields eight themes relevant for future perspectives on eServices. They serve as main topics of conversation in the interviews (interview questions are added at the end of every topic in italic):

1. *Objectives* [10,11]: Policy advisors can have internal objectives (e.g. efficiency), demand sided objectives (e.g. quality of service delivery) or innovation oriented objectives for offering services online. (*What is the most important objective of electronic public serviced delivery?*)
2. *Presuppositions* [6]: The ICT policy of the government is characterized by few barely founded presuppositions about what citizens want. Three dominant assumptions are: citizens wish to distribute information to the government onceonly, citizens would like one single online access point for all governmental organizations and citizens appreciate proactive service delivery [4]. (*Are the presuppositions true?*)
3. *Channels* [12]: Four channels can be distinguished for service delivery: Personal (e.g. counter), electronic (e.g. the internet or e-mail), written (e.g. letters and faxes), and the telephone. It becomes more and more obvious that the internet is not the perfect one in public service delivery [5]. Multichanneling is defined as the use of multiple service channels within one public service delivery process or the use of different channels for different service delivery processes [12]. However,

there are only little concrete interpretations of multichanneling. (*What channels will remain in the future and how are they positioned in relation to each other?*)

4. *Services* [6]: A possible explanation for the lagging of the actual use of electronic services is that governments anticipate too little on the popularity of some services [4]. More attention to the development of so called 'trigger services' could cause the amount of use to raise. Although there are some examples of successful electronic services, like electronic tax filing, used by almost 60% of the Dutch population [13], we still have little knowledge about what characterizes trigger services. (*What services might trigger citizens to make more use of electronic public service delivery?*)
5. *Contact moments* [6]: The presuppositions suggest that the number of contacts between citizens and government will change. Proactive service delivery could lead to one-sided contacts, once-only data distribution to a decrease of contacts and deploying one counter for all governmental institutions to a decline of personal contacts. (*How will the number of contact moments between government and citizen change in the future?*)
6. *Digital skills* [6,14,15,16]: The Dutch government aims to be in the European top 10 regarding ICT and innovation in 2010 [3]. One of the objectives is to empower the innovation strength of the public sector. At the same time the discussion to what extent the digital divide will manifest itself as a structural problem is going on. A dilemma rises whether public service delivery should aim at improving innovation strength, or at closing the digital divide. (*Should governments aim at the skilled or at the laggards? How?*)
7. *Architecture* [10,11,17]: Currently, most institutions have their own front and back office. Current developments seem to lead to integrated back offices. Integrating back offices properly is a complex operation because ICT-facilities within the government are very diverse, as well as on technological maturity, complexity, as on scale. This makes developing common standards difficult. However, online personal portals suppose immediate actualization and therefore a direct connection with the back office. (*What will the architecture of electronic service delivery look like in the future?*)
8. *Responsibility* [15]: For realizing electronic service delivery according to the different perspectives respondents forecasted, necessary shifts in responsibility are very likely. (*Who should take responsibility for realizing the sketched future vision?*)

A number of 20 single interviews are conducted. Interviews are a good way to elicit unanticipated information and to enable great depth and meaning of communication experiences to be explored and recorded [18]. Exploratory single interviews are best suited to generate issues and enable the interviewer to specifically ask about individual opinions and the reasons to make specific choices. For every theme described above, a question was formulated. The main objective was to let the respondent talk freely, allowing him or her to generate issues. The semi structured interviews lasted approximately 90 minutes and were held in the respondents' offices.

Twenty policy advisors, eLeaders and scientists on different levels (municipal, provincial, national and executive policy agencies) were selected based on their position and responsibility for eService policy. Furthermore, five scientists known in the

eGovernment field with relevant publications were selected. Of the 25 approached respondents 20 agreed upon an interview; four on every governmental level and four scientists.

The data collected during the interviews were analyzed in two steps. First, the interviews were transcribed fully. Second, for every theme a list of factors was extracted using inductive analysis by categorizing the different answers per theme; the different factors emerged out of the data rather than being imposed on them prior to data collection and analysis. The following section outlines the most important findings of the qualitative study. Each of the themes and corresponding factors are discussed in detail. The findings are illustrated with quotations from the respondents. The italic numbers in between parentheses correspond with the number of respondents that elected the corresponding emerged factor.

3 Interview Results

3.1 Objectives

Six objectives for offering public services online can be identified: transparency (3), efficiency (11), innovation (2), quality of service delivery (12) and cutting red tape (1). Efficiency and the quality of service delivery are the most important motives. The former especially at federal executive agencies: “Efficiency, efficiency and efficiency. Everybody profits when we stop squandering money.” According to one scientist efficiency is indeed important, because “too many things are performed twice”, but the starting point for executing ICT projects should be the perception of citizens. “Current objectives are too much technically oriented. It’s all about putting things on the net. The real purpose should flow from society.” Federal executive agencies consider quality of service delivery not as an objective, but as a means to improve the efficiency, in contrast with municipalities. A critical remark regarding quality is that although it is an important objective, there will never be a perfect service delivery: “With the continuing of developments it is an unfeasible battle. The electronic government should be realized as efficiently as possible, but at the same time the complexity of the relations in society will increase, which means that the perception of having a better service delivery will never change.”

On the national level the opinions about the importance of a strong innovation position vary. Stated disparagement is that the government doesn’t pay the bill directly for not being innovative, contrary to private organizations doing eCommerce. Because of this, two respondents don’t expect major changes in the future.

Transparency and image are mentioned as well. One respondent believes that transparency will track and eliminate the laxness of civil servants. Image is important with respect to comparisons with the private sector, which indicates that the government should make more use of the current developments.

Finally, one scientist considers electronic service delivery as an objective itself for pushing the electronic government as a whole. The attention for service delivery is disproportionate according to this respondent. “It is an important theme, but at the same time the electronic government is so much more than service delivery alone. The time has come that our attention shifts to other aspects, like eDemocracy.”

3.2 Presuppositions

Categorizing the different opinions regarding presuppositions is difficult because they vary a lot. However, most of the respondents on all levels seem to go along with all three presuppositions.

1. *Once-only data distribution*

Once-only data distribution to the government has sweeping consequences for the way public organizations work. It requires coherence and unity in information systems. The interviews show that almost everybody agrees that it will pay off soon. Only two respondents hesitate. One thinks it is a fabrication of politicians and the other can imagine very well that citizens don't want governments to share their personal data. The general point of view is well phrased in the following quotation: "Why register the same data at different places? Let the governments communicate with each other. The government should make more use of its administrative possibilities. This makes it much easier for citizens."

Although most respondents have the same opinion, they doubt the feasibility of the whole operation. "It is very expensive to realize all these exchanges between back offices and we are already working on it for a long time. The problem is that organizations don't trust each other just like that". In the future most respondents believe that integrating back offices will go more effortless.

Another cited aspect is privacy. Some respondents think this will be a huge problem in the future against what governments should put great effort. Governments will have to make very clear who has access to what data. Other respondents believe that everybody will understand that data are going to be exchanged and that distrust will wear out, "especially when citizens profit".

2. *One online access point for all governments*

Opinions regarding one online access point for all governments are diverse. "There is a healthy distrust against the government. Personal all-embracing portals are good initiatives, but it is necessary to perform research among citizens first. I won't be surprised when nobody is going to use them. Governments cannot permit themselves anymore to create solutions that nobody uses."

Some respondents are convinced that one online access point is going to be a success. They also believe that organizations are going to lose their own identity: "A citizen or company doesn't care whether you are a municipality or a federal executive agency; they just want their service or product. This is a matter of clever bonding."

Other respondents consider this view as a utopia, taken the current number of access points into account. "For service delivery, citizens want to go to the website they are used to. For taxes, they would like to see the tax administration's logo. Organizations are going to keep their own look and feel. It is not very sensible to put everything behind one portal."

Two other mentioned perspectives are 'one single point of contact' (citizens are redirected to the right institution) and 'no-wrong-door' (citizens can do everything at every institution, which results in competition on product level).

3. *Proactive service delivery*

Most respondents believe it is inevitable that proactive service delivery becomes reality. They vision a government that takes all initiatives itself and becomes more helpful. “When I make pancakes and bring the batter with me, but forget the milk, they will tell me.” It is believed that citizens will be better served when organizations tune their data and that this will become ordinary soon.

One scientist is convinced that public organizations are going to cooperate in the near future, but doubts whether it is desirable. “We also need active citizens; there is a chance that we make them lazy using proactive service delivery. In the near future everything will be spoon fed. Citizens won’t lose themselves anymore in the material which zeros the change of discovering inaccuracies. Sometimes it is necessary that citizens correct the government. Our society is based on checks and balances.”

Finally, one respondent expects heavy resistance. “We have to make very clear what the added value for citizens will be. Otherwise, big brother will become reality.”

3.3 Channels

Roughly three different perspectives can be distinguished regarding service channels: internet as the primarily channel (2), channel independent service delivery (9) and a multichannel approach with specific tasks for each channel (8). Also, the appearance of new channels is mentioned by two respondents.

With the exception of two respondents, all realize that the internet is not going to be a complete substitution for traditional channels. “The best customer is the invisible customer” according to a municipal servant who believes that in the future a push to the internet will result in a complete online service delivery. A national servant agrees: “There is a huge need for the internet. In the future everything is possible online, the more complex a task the bigger the revenue for automating it. It is too expensive to maintain all channels.”

According to most respondents service delivery in the future will be channel independent. “We strive for qualitative service delivery on all channels, the customer makes the choice.” However, it is believed that most processes will go digital for efficiency reasons. Respondents do prefer sending citizens to the internet: “We will be able to get the citizen to the channel we prefer. This means less personal contacts because these are expensive. But, just like banks, physical contacts will stay. It is an illusion that these will disappear.” The elderly are taken into consideration as well: “We will always have to bear in mind the needs of all generations when choosing and shaping the channels. It is a wise idea to segment different groups of citizens.”

Another popular vision is the integrated multichannel approach. “The strategy for e-service delivery in the next decennia will be applying a balanced positioning of the different channels. Channels should act in conjunction and strengthen each other. This will result in satisfied citizens and in improved effectiveness and efficiency.” The respondents agree that personal contact will also play a significant role in the future. They believe that a multichannel approach results in citizens that are better prepared when visiting physical desks. Two scientists emphasize that it is important to take a more sagacious look at the nature of the different services and products. One respondent portrayed possible consequences of multichanneling: “We will be able to distinguish different groups of citizens and therefore also the weaker part that needs

special attention. This will make the relationship with citizens more diverse. The government will be able to follow complaints and comments which directly results in better served citizens. All channels are going to stay, they only attract different users.”

Two respondents expect a lot from new channels. Internet will penetrate much further for simple things and integrate with other communication means. They believe that the telephone and counter will be fully integrated resulting in interactive applications where virtual servants assist citizens. “This mix of media makes reaching trouble groups of citizens possible.”

3.4 Services

This paragraph discusses the different services that, according to the respondents, are best suited for online availability and might serve as triggers.

Two scientists stress that it is pure guesswork to cite trigger services at this time. They strongly believe more research is needed. “The success of e-government is a non-specific feeling of quality when having contact with the government. This feeling is determined by specific services. We should perform deeper analysis of which services are used mostly, which services lack usage, which services are most emotional and about which services citizens are most frustrated. For some services citizens don’t care when they don’t work properly, but for others it can make them very angry”. Another respondent thinks the concept ‘trigger service’ is only relative because it differs in between target groups.

A municipal servant suggests taking the municipal service top 10 for every municipality: “It is possible to get a license for accessing parts of the country with horse and wagon or building a nuclear power plant. Why put effort in these services? We should make better selections instead of always making everything uniform.”

Most respondents agree on the fact that the best trigger services are those services with high volume: “People should not have to ask themselves what the returns are.” This goes particularly for the category “sick, weak and obnoxious”, because here citizens have a lot of contact with the government. “Most effort should be put in time intensive processes where governments have to cooperate a lot.”

Another trigger service mentioned is getting a better understanding of what the government knows about citizens. This might have a direct influence on vindication too, since citizens are the best preservationists themselves.

There is one scientist who pleads for a complete computerization of society. “Then, there will be far less mistakes and a substantial increase of prosperity.”

3.5 Number of Contact Moments

Assumptions like once-only data distribution and one single online access portal suggest that the number of contact moments between citizens and government will change: they can disappear (3), decrease (10), stay constant (3) or increase (4).

One scientist describes the fundamental change in relationships between government and citizens that will take place in the coming years. “On some levels an invisible government will appear and on other levels the government will become more visible. The part were the government will be invisible alters to the electronic highway.” Another scientist believes that governments will be approached differently

by citizens. “Already there is much more e-mail traffic that delivers other questions and desires. Citizens expect fast answers.”

Three respondents state that citizens most likely prefer no contact with governmental organizations at all. According to them an invisible government, that understands when to give what to each citizen, will come into existence. “The most efficient contact is no contact at all. This also will result in decreased risks of fraud.”

Most respondents believe that the number of contact moments will decrease for different reasons: the private sector will take over services, a better organized government will result in a reduced number of citizens that experience service problems, connected back offices will diminish the need of the government to make requests and finally, proactive service delivery will prevent citizens to come to the government with the same question over and over again. One national servant believes that the numbers will only decrease instinctively. “For some services a citizen will experience a lot of contacts and for others they won’t. Some services will disappear in the back offices, but other products will become more visible.”

Finally, four respondents believe that the number of contacts will increase. A possible cause is the success of online personal portals. “Citizens will become more aware of the tasks of the government. ICT makes contact making much easier and this will directly result in an increased number of contact moments.” They believe that “the government will become more and more a helpful organization.”

3.6 Digital Skills

Opinions about citizens’ digital skills diverge. Four rough perspectives are: digital skills are no issue anymore (2), governments should put most effort in the digital skilled citizens (5), governments should put most effort in the laggards (4) or governments should aim at both (7).

Two respondents believe that all citizens will be able to do everything online in the near future. According to one of them this is already the case: “Research shows that when the need is there, education or race doesn’t matter. Citizens will find a way to do it.” The other respondent stresses that citizens should not be underestimated. “The use of the internet, for example eBay and electronic tax declarations, is already very high, so I think the level of skill is not the problem. The problem will be connecting the next generation with their government on psychological level.”

Five respondents favor a government that aims primarily at citizens that fully participate in the digital age. One of them believes that skills will be of no concern in the near future because all applications will be of excellent quality. Most of them notice a shrinking group of laggards: “A toddler is already smarter than its parents. For the small group that stays behind we just maintain a traditional channel. That’s it; you don’t want to spend 95% of your time in 5% of the laggards.” These respondents consider it strange that exceptions are laid down as standard and do believe that governments should aim mainly at the digital skilled. Respondents in this category believe that the problem of not everybody participating will solve itself over time and that everybody eventually gets the same level of skills. Finally, one respondent brings up the discussion whether not participating in the digital age is a matter of skills: “A lot of the laggards seem to choose not to participate. A government has the obligation to give everybody access to its services, but is not a service of convenience.”

The opposite is also mentioned by a few respondents that believe the government's main task is to involve the laggards. "A homogeneous population will be much easier for eService delivery, but the reality is very different." Mentioned solutions that should prevent disadvantages for the laggards are diverse: keeping electronic service delivery as simple as possible, aiming at the average skill level of citizens, offering different search strategies, offering traditional channels, integrating electronic service delivery in education, stimulating use by rewarding citizens and finally offering proactive service delivery. These respondents agree on the fact that benefiting the digital skilled is unwanted: "Citizens vary from dinosaurs to cyber chicks. The government has the responsibility to reach them all."

Most respondents believe however, that the government should aim at both the digital skilled and the laggards. In their view, citizens that are digital skilled should be facilitated at the most and laggards should get all the help they require. "We have to create advanced services but also take care for the weak. This also requires progressiveness, but that's totally undeveloped yet."

3.7 Architecture

Although not all respondents want to engage in what the future design of the electronic government looks like, there are roughly four predicted visions: one front office and one back office (1), one front office coupled to multiple back offices (4), multiple front offices coupled to one back office (2) and multiple front offices with multiple back offices (7).

One respondent wants citizens to be the owner of personal information. "Citizens will have contact with one front office. All back offices can be integrated and connected to that front office as one entity. Exchanging information has always been way too expensive. But, realizing this view suggests a total shift of paradigm."

Three respondents plead for the development of one front office. One believes this should be the municipality. The other two suppose the development of one agency representing all detached governmental institutions. "The government will vaporize on the front office level but divided back offices will persist."

In the view of two respondents the separated front offices will stay and will be connected to one giant back office containing all governmental information. "Every organization will keep its own front office and identity. But, we should think more strategically resulting in a design paradigm for reinventing back offices. It is important to proclaim a catalyst for standardization of developments."

One scientist thinks it is a typical boffin thought that one single back office will appear in the future. "Technically is it is possible to create one government, but this will never happen because every organization has its own interests and target groups. Redundancy on means and sources is not bad, but with creating one back office we will lose a lot of singularity, which will go at the expense of quality." This respondent does believe that organizations will work more and more in accordance with government wide engagements that make data exchange possible. This is extended by one scientist by sketching the 'network oriented distributed infrastructure'. This structure is characterized by harmonization and standardization instead of centralization. "It doesn't matter that there are multiple systems. As long as data exchange between, and knowledge in the systems, is in order."

3.8 Responsibility

The question who should have the responsibility for realizing the different visions resulted in varying answers. Some believe that the responsibility must stay at the organizations itself so that citizens will always be able to retrieve the organization that delivers the demanded service. In contrary, four respondents request for more collaboration and shared responsibility. “Your own efficiency and methods could also work out positive for others.”

Strong leadership is also brought up: “Don’t let organizations go their own way. At specific policy areas, organizations can preserve their own responsibility, but in the area of ICT we should integrate.” There is no consensus on who should take the lead. Several possibilities are mentioned. Firstly, a national project group less driven by politics. In this project group a project leader should report directly to the minister. Secondly, the State should take all responsibility for further developments of the electronic government. Thirdly, one new federal executive agency will be developed for eGovernment, represented by several governmental institutions. “When all organizations are represented, it is possible to exert more direction than currently possible.” Fourthly, members of government that can build bridges are engaged: “A strong leader in ICT will only confirm hierarchic thinking, something we have free ourselves off. We need a concern thought.” Fifthly, a private company responsible for the whole governmental administration is established. “Then you can be sure that registrations are in order.” Finally, a new ministry is proposed: “Why invent service concepts independently? The problem is that everything is autonomous. That inefficiency should vanish. There should be one new ministry for operational management.”

4 Conclusions and Discussion

The results of this research indicate that Dutch leading figures in the field of eGovernment have different future visions regarding electronic public service delivery. They have different objectives, presuppositions, channel approaches and opinions regarding ‘trigger services’. Furthermore, they don’t agree on the number of contact moments between citizens and government, have different opinions regarding digital skills, plead for various architectural designs and place the responsibility for electronic service delivery in different hands.

The main conclusion is that there is no univocal future vision on electronic public service delivery in the Netherlands, both for policy advisors and scientists. A positive implication might be that exchanging ideas and approaches can have constructive effects on the quality of electronic service delivery. The diverse visions contain interesting elements ready to elaborate. This might lead to making obvious choices instead of outlining an unclear compromise policy. However, there are negative implications as well. Diverging future perspectives for example might result in the gap between supply and demand as suggested by Van Deursen et al. [4]. If this is the case, then the situation described here might not be unique for the Netherlands. When countries internally already contain varying future perspectives, presenting a common front for Europe, as stated in the Lisbon conference, seems impossible.

Most problematic however, is that some choices are extreme in that they seem to go beyond the possibilities of the political construction, at least in the Netherlands. These visions oppose both constitutional and political preconditions. It is desirable that future developments fit the political system because a revolution is unwelcome and moreover, very unlikely. Furthermore, these visions leave no room for other views in the discussion and might lead to damaged citizen's interest (e.g. excluding computer illiterates). This might also be the case when some presuppositions are carried through without a strong foundation. It is recommended that future perspectives better correspond with political point of views and show more conformity. No one benefits when policy makers follow their own path to their idea of the future.

The discussion on how to shape the future of eGovernment has been going on ever since the 1990's. Despite this, there still is a lack of concepts on how to do things. This raises the question whether the introduction of technology enables a leap forward. The results seem to suggest that automated chaos remains chaos. The principles of NPM are indeed aimed at; however, the NPM vision as body of thought alone is not sufficient. This conclusion is in line with Grönlund & Andersson's results [10] who concluded that eGovernment research is diverse and mainly descriptive. There still is a lack of theories and eGovernment misses its own research area, as suggested by Scholl [19]. A possible explanation for the diverse visions is the fact that research lacks a uniform direction, which in turn might be explained by the fact that eGovernment researchers have different perspectives that influence the research agenda.

There are two main discussion points. First, the sample of 20 respondents is quite small. However, it is difficult to find more leading figures in the field of eGovernment in one country. Since the 20 respondents are responsible for a large part of the eGovernment policy, the results are definitively valuable. Second, the interviews took place in the Netherlands; however, it is likely that in other countries the same variety of future perspectives exist. Further research should follow, expanding the exercise to other EU countries, addressing the same kind of audience.

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E-Services for Citizens: The Dutch Usage Case

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Abstract. In most countries, the maturity of eService delivery is measured by the supply of electronic service delivery. However, in many countries there is a gap between the supply and demand of eServices. We studied the actual use of eServices and the potential use of eServices in the Netherlands. We found a gap between the actual and potential use of eServices. Main explanations for this gap are the lack of knowledge about the availability of eServices, the media use characteristics and the social characteristics of the (non)users. Conclusions of our study are that the potential usage is high and second, simply putting services online is not enough. People have to get to know the services and need the skills to use them. Implications for future research are that we need a deeper understanding of factors that underlie the use of eServices, since supply alone will not lead to use of eServices.

Keywords: eServices, service usage, citizens, electronic service delivery.

1 Introduction

Almost all public authorities in the European countries have waged efforts to offer services electronically. Several programs are introduced to promote and advance the development of electronic services. In the eEurope 2005¹ program one of the objectives was that “the Member States should have ensured that basic public services are interactive, where relevant, accessible for all, and exploit both the potential of broadband networks and of multi-platform access”. Nowadays, the Netherlands aims at offering 65% online availability in 2007 [1]. In sum, in policy plans, the supply of eServices is dominating. According to van Deursen et al. [2] the attention for the actual demand and usage of services by European citizens is only secondary. They described the existence of a gap between supply and demand of online services and discovered that a lack of motivation, physical access and digital skills are very important for the general lag of usage of online public services. However, these factors cannot explain the large differences of the actual use of electronic government services between the Netherlands and, for example, Scandinavian countries (comparable countries regarding physical Internet access).

¹ (Com(2002) 263; eEurope 2005: An information society for all).

The gap between supply and demand of eServices just described calls for more understanding of the use of eServices and the characteristics of the eServices user. Currently, we lack knowledge about the use of services and about users, mainly because government's own recorded data are fragmented and incomplete [3], so no complete picture can be drawn.

In this paper we explore the use of eServices from the perspective of the Dutch citizen. We present the main results of a nationwide survey of current (2006) use of eServices in the Netherlands. We focus on the actual usage of eServices, on both the local and the national level. Furthermore, we take a closer look at the characteristics of the eService users and the non-users. By doing so, we try to gain more insight in the factors that may help or hinder the future development of eServices.

First we draw the background of the study describing the development of eServices in the Netherlands in the European context, the different typologies of eServices and the existing knowledge of the field. We conclude this section with a number of research questions. After a description of the methodology used section four contains the results of the study. In the next part we draw conclusions regarding the research questions. We end our paper with some points of discussion and suggestions for future research.

2 Background

The Netherlands have always been ambitious when it comes to the development of electronic public services. In fact, the Netherlands was among the first European countries having eGovernment programs. In 1994, the first national ICT-action program was being introduced. In 1998, the 'Actieprogramma Elektronische Overheid' (Action Program Electronic Government), was launched. This program proposed and realized coverage of electronic public services that reached 25% of total services in 2002. Subsequently, in the 2003 program 'Andere Overheid' (Different Government) the objective was an electronic coverage of 65% of all services in 2007.

Nowadays the eServices situation is fairly complex in the Netherlands. On the one hand there are areas in which developments in the field of eServices (supply) continue to go at a high pace. The IB-Groep, responsible for the study grants in the Netherlands is among the European front runners when it comes to both the supply and demand of eServices. The same applies for the Dutch Tax and Customs Administration, which received 82 percent of the income tax filings electronically by 2005. On the other hand, some drawbacks can be observed. When it comes to the use of service channels, including those needed to prepare electronic income tax payment, the traditional channels, such as telephone and front desk, remain the most important means of interaction, despite the efforts of the government to persuade the citizens in using the electronic rather than the traditional channels [4, 5]. Finally, and most important, as mentioned previously, there is a large gap between the supply and demand of eServices [2]. Many of the services being offered online in the Netherlands are hardly being used and only a few services are responsible for the bulk of the eservice usage in the Netherlands.

In reaching the targets of online availability of eServices, what should be classified as a service and when is a particular service fully online? To answer these questions a

number of operational definitions and models to distinguish public eServices have been proposed [e.g. 6, 7]. The most popular model is used by the EU for benchmarking eEurope [8]. It consists of a set of indicators. Two of them concern eGovernment: the percentage of basic public services available online and the use of online public services by the public for information purposes or for the submission of forms. The following stages are applied in several countries to specify these indicators and measure the level of online sophistication of services:

Stage 0	No information;
Stage 1	Information: online information about public services;
Stage 2	Interaction: downloading of application forms;
Stage 3	Two-way interaction: uploading of application forms;
Stage 4	Transaction: case handling; decision and delivery.

Though this model and the others referred to reveal a supply-side orientation - they depart from the capacities of the eservice or website supplied - this EU benchmarking model also offers the opportunity to observe to which level citizens actually use eServices: do they only retrieve information or do they also engage in two-way interactions and transactions? Therefore this model is used as one of the analytical instruments in describing eservice use in the Netherlands.

2.1 Research Goals and Questions

The primary goal of our research was to deliver a descriptive overview of the actual usage of the most important, most widely used electronic services in the Netherlands in 2006. These are the services offered by municipalities (local level), by ministries and by their executive authorities (national level). Services from provinces and regions, as well as semi-public and fully privatized organizations are outside the scope of this research. Furthermore, we wanted to gain insight in the potential use of the eServices, considering the internet connectivity of the population and the intention to use the Internet. The secondary goal was to gain more insight in the characteristics of the eServices users and the knowledge of the availability and the attitude towards the use of eServices.

These two aims result in five research questions:

1. *What is the actual usage of eServices by Dutch citizens?*
2. *What is the potential usage of eServices by Dutch citizens?*
3. *What are the attitudes towards use of eServices of Dutch citizens?*
4. *What is the level of knowledge about the availability of eServices of Dutch citizens?*
5. *Who are the users in terms of social characteristics and of media or channel use of services?*

To answer these questions, we conducted a nationwide survey. To ensure that both people with and without a computer and Internet connection would participate in our study, we used a two step research approach. In the first step, the telephone was used to select respondents for the main-questionnaire. Citizens with a computer and Internet connection were asked to fill an online questionnaire; citizens without them were interviewed by telephone. Citizens were also offered the possibility to have a personal face-to-face interview at their homes.

From the 4151 Dutch citizens that were contacted by telephone, 1896 agreed on participating. Eventually a total of 1225 persons completed the questionnaire. Formally, this is a response rate of 30 percent. Among the respondents 21% (n=255) appeared to be people without access to computers and/or the Internet. This percentage is close to the 19% reported by the Dutch Bureau for Statistics (see www.statline.nl, retrieved August 2006). The ultimate sample appeared to have an overrepresentation of seniors, women and people with higher education. To have our sample reflect the (demographic) characteristics of the Dutch population we weighted our data. However, the data did not significantly change by this operation.

The main questionnaire contained all questions related to the use of electronic services by citizens. For the group of respondents without computer and/or Internet connection, a special questionnaire was constructed. Questions about the use of eServices which they couldn't use were omitted and questions about reasons for not having a computer and Internet connection were added.

We measured the use of government eServices on two levels; the local level (municipalities) and the national level (various authorities). First we asked some general questions about the use of services (visiting websites and the use of e-mail) on both levels and then we turned to the use of more specific services. Next to services delivered by municipalities, we asked the respondents about services of the following national authorities: SVB (Social Insurance Agency), CWI (Centre for Work and Income), UWV (Employees' Insurance and Social Benefits Agency) and the IB-Groep (responsible for student grants). The services are displayed in Table 2. We only included services that were available electronically on a national level. This wasn't possible on the local level, since no service (except e-mail) is being offered on a 100% scale nationwide. Table 1 shows the levels of availability of the local services included in the study. These levels are based on the eEurope [8] model. For reasons of simplicity, we distinguish between information and transaction services in this Table.

We only asked the respondents about the use of a particular eservice when this service was relevant for them. For example, we only asked the students if they had applied for a study grant electronically.

Table 1. Availability of the five most frequently used eServices in Dutch municipalities[9]

eService	Availability in percentage of municipalities	
	Information (level 1)	Transaction (level 4)
Notification of the need of waste collection	85.0	6.6
Application for a building permit	24.8	71.1
Appointment to apply for a passport	89.7	2.8
Request for a certificate of birth or citizenship	54.0	15.0
Notification of address change	26.3	8.4

According to the figures in Table 1, the availability of different levels of eServices in the 467 Dutch municipalities is quite different. After e-mail (since 2005 available in all Dutch municipalities) the availability of services at the information level is especially high for making an appointments to apply for a new or prolonged passport (90%) and information about the collection of waste (85%). The availability of the

application for a permission to build is very high at the level of transaction (71%). Reason for this is that most municipalities simply link their website to the website of the Ministry of Housing enabling people to upload the form they retrieve from the municipal website.

3 Results

The following section will describe the results of the study. First, we describe the results of the first two (use and intention) research questions. In the second part, we present the results regarding the third, (attitude towards use), fourth (knowledge of the availability), and fifth (social and media use characteristics) research question.

3.1 The Actual and Potential Use of Public eServices by Dutch Citizens

Table 2 shows the general indicators of eGovernment usage by Dutch citizens in 2006, website visits and usage of e-mail. Of all Dutch citizens, 56% ever used an eService of the government. For Internet users this is 71%. The use of eServices by Dutch citizens addresses the local government (the municipality) more than the national government and visiting websites is more popular than sending an e-mail. Off all Dutch citizens 57% has ever visited a website of a municipality (Internet users: 71%) and 21% has ever sent an e-mail to the local government (Internet users: 27%).

Table 2. General indicators of eServices use by Dutch citizens 2006

Question	Answer	Internet	Total
		Population %	Population %
Did you ever use an electronic service of government ?	Yes	71.0	56.2
	No	29.0	43.8
Did you ever visit website of the local national government?	Yes, local government	23.7	19.0
	or Yes, national government	11.8	9.3
	Yes, local and national government	47.7	37.7
	No	15.7	33.1
Did you ever send an e-mail to the local/national government?	Don't know	1.1	.9
	e-Yes, municipality	16.1	12.7
	Yes, national government	10.7	8.4
	Yes, municipality and national government	11.0	8.6
	No	59.1	67.8
	Don't know	3.1	2.5

Table 3 illustrates the actual and potential (intentional) usage of more specific information and transaction eServices at the local and national levels.

Viewing the two columns of actual use we can draw the conclusion that most services are only moderately used in the Netherlands with percentages below 30 in 2006. This particularly goes for the electronic municipal and police services (between 12 and 36). The main exceptions are the most successful national eServices in the Netherlands, the income tax return and the job vacancy service for the unemployed

that reaches the big majority of this sub-sample. – With all services we first assessed whether the particular service was potentially needed by the particular category of people the respondent belonged to at the time the questionnaire was conducted. - The income tax return is used by 68.5% in our sample and by 82% of the population of actual tax payers as more narrowly defined by the Dutch Tax Administration. Job vacancy searches and applications are used by 87% of the unemployed because in practice this is almost obligatory in this country.

Table 3. Actual and Potential (Intended) Use of eServices in the Netherlands, 2006

eService	n(*)	Actual use		Intentional use	
		Yes	No	Yes	No
Municipal Services					
Notification of the need of waste collection	92	22.8	77.2	74.8	17.5
Application for a building permit	127	32.3	67.7	78.0	13.3
Appointment to apply for a passport	100	36.0	64.0	74.8	20.6
Request for a certificate of birth or citizenship	50	12.0	88.0	70.2	22.1
Notification of address change	141	19.9	80.1	86.7	9.3
E-mail service	967	28.1	69.5	76.5	15.1
Police Services					
Electronic report harm and offences	578	15.7	84.1		
Tax Services					
Income tax return	935	68.5	31.5		
Health care subsidy	537	24.2	75.8		
House rent subsidy	432	6.9	93.1		
Childcare subsidy	116	34.5	65.5		
Social Services and Benefits					
Unemployment benefit – information	544	23.9	75.7	81.2	10.9
Unemployment benefit – transaction	402	3.7	96.3	60.1	25.3
Vacancies/job search CWI – information	16	87.5	12.5	75.0	25.0
Vacancies/job search CWI – transaction	15	86.7	13.3	70.0	30.0
Study grant – information	36	77.8	22.2	100	-
Study grant – transaction	32	31.3	62.5	86.1	5.6
Old Age Pension – information	114	34.2	65.8	69.4	25.6
Old Age Pension – transaction	72	16.7	83.3	44.2	40.9
Child benefit – information	258	27.1	71.7	76.6	18.4
Child benefit - transaction	232	9.9	86.6	69.6	22.3
National Government Information Services					
Postbus 51.nl (public information site)	967	28.6	70.3		
Overheid.nl (national information portal)	967	25.6	70.5		
Websites of Ministries	967	41.9	50.8		
DigiD (citizenship number, optional)	511	43.2	56.8		

Note: * n = number of sub-sample potentially needing the service (967 = total Internet population)
 For reasons of visual clarity Do Not Know percentages (remaining part, adding to 100) not exposed

Looking at the two columns of intended use we see that the potential of use of almost all of these services is much higher. Usually it reaches percentages between 70 and 80 (see table 3). We have measured this by asking a couple of questions right after the question of actual use of the particular eService. For those answering ‘no’, we asked whether they would use this service when it was available and at the time they needed it. When they answered ‘no’ this was conceived as the lowest level of

intention to use the service. When they answered 'yes' this was interpreted as a medium level of intention. Actual use of the particular service was labeled as the highest level of intention. This distinction between actual and intended use enabled a more or less exact determination of the potential of the use of eServices. Adding the measures of intention of all local and national services we found that there was an overall correlation of +0.542 (on a regression scale from - 1.0 to + 1.0) between actual and intended use. For the local services this correlation was only +0.383. This means that the potential of growth for municipal eServices in the Netherlands is higher than that for the national services.

For several reasons, containing too much detail to explain them here, we did not choose to measure the intention of use of all eServices in the Netherlands in the same direct way. See the blank spots in the two right columns of Table 3. Here reasons for use and not use were measured in an indirect way that was not comparable to the direct way. However, the services that are used for the quantitative measure of potential are a cross-section of comparable local and national services.

3.2 Attitudes Towards Public eServices

The general attitude of the Dutch population towards public or government eServices was found to be very positive.. The statement that 'Internet services are an improvement of government service' reached a support of 7.2 on a 10-point scale. The statement 'It is a right thing that the government offers Internet services' even received a mark of 8.2. The opposite statement of 'Interne services of the government are not attractive to use' was rejected with a mark of 4.7. The same goes for: 'In general the Internet services of the government are not user-friendly' (4.6).

However, the attitude of the part of the sample that has no access to computers and the Internet was significantly less positive. The same was observed among those groups generally found to be at the 'wrong side' of the digital divide: seniors (above 65), people with low education and those with few computer- and Internet experience. Positive attitudes systematically increase with educational level and 'digital' experience and decrease with age. No significant gender differences were observed.

3.3 Knowledge of the Availability of eServices

One of the most striking results of the survey was the high number of respondents with Internet connections that revealed to be not informed about the availability of particular eServices. This appeared to be especially true for municipal eServices. In general, more than 70% of municipal eServices were not known by the Internet users (see table 4). When taking into account that in many Dutch municipalities particular services are not available yet, or only available at a particular level (information or transaction), the results hardly varied. Even when we asked Internet users in municipalities with high-level transaction eServices, a full alternative to traditional transactions, we could still find a majority of potential users not knowing the service.

The only service being 100% available in the Netherlands (e-mail), was not known by 32% of Internet users while 16% gave the wrong answer claiming that this service did not exist.

Evidently, the lack of information about the availability of services is a prime reason for the gap between potential and actual use of eServices in the Netherlands.

Table 4. Do-not-know Answers about the Availability of Municipal eServices

	Do not know (all conditions)	Do not know when service is offered at level 1: information	Do not know when service is offered at level 4: transaction
Notification of the need of waste collection	72.4	73.6	62.7
Application for a building permit	77.3	75.3	77.5
Appointment to apply for a passport	73.3	75.7	59.9
Request for a certificate of birth or citizenship	84.4	83.2	85.1
Notification of address change	79.0	79.8	78.6
Email service	48.0 *		

Note: * Do not know answers (32%) added with Wrong answers (existence of service denied): 16%

3.4 User Characteristics

Social characteristics of users. In this paragraph users are described in terms of social characteristics. Actual usage was classified in terms of no or little, medium and high usage. The same classification is used for usage intention. See Table5.

Table 5. Usage and intention of use of eServices by users with different social characteristics

Social Characteristics	Usage			Intention		
	No/little	Medium	High	No/little	Medium	High
Age:						
≤ 30	39	56	5	28	42	30
31-45	68	26	6	14	60	26
46-55	65	32	4	22	54	24
56-65	76	24	0	53	36	12
65+	90	9	1	82	10	8
Social Position:						
Employed	61	34	5	17	53	30
Self employed	56	39	5	21	53	27
Unemployed	25	54	21	19	50	31
Disabled for work	76	22	2	51	42	7
Retired	84	15	1	68	26	8
Students	44	56	0	24	57	19
Housewife/Houseman	85	15	0	48	49	3
Education:						
Low	80	19	2	57	32	19
Middle	66	31	4	33	47	55
High	61	35	4	10	21	26

Table 5 shows that all differences between social categories of the population considering physical access and use of digital media known form digital divide

research [10, 11] are expressed in the distributions of actual and intended use of government eServices. Considering age elderly people score significantly lower on actual and intended usage than younger people. This particularly goes for seniors above 65, but decline already starts at the age of 55.

Analyzing the social positional background large differences appear between those inside the labor process or schools and those outside (retired, disabled and housewives/men) with the only exception of the unemployed that have to use the Internet for job vacancies and applications. Actual and intended use of students is perhaps lower than expected for the 'digital generation' but this is to be explained by the lower need students still have for government eServices. A related result not presented in Table 5 is that families with children are the most frequent users of eServices among household types.

Finally, educational level appears to be a strong predictor of the actual and potential use of government eServices. Both types of use grow with level of education, with intention even stronger than with actual use.

Media use characteristics. The general results of the survey show that media use, including service channel use is perhaps the most important factor in explaining the gap. In our definition, media use is a combination of possession of and experience with digital media (in this case the Internet and computers) and the preference for the usage of different service channels for contact with the government.

Table 6. Use of eServices by people with different Media Use Characteristics

Media Characteristics	Usage		
	None/little	Medium	High
Possession of digital media:			
No internet and computer at home	97	3	0
Only possession of computer/laptop	91	9	0
Possession of computer and internet	69	36	4
Experience with digital media:			
No experience	98	2	0
Low/little experience	93	6	1
Moderate experience	64	33	3
High experience	48	46	6
Preferred medium for contact with the government:			
Front Desk	83	16	2
Telephone	68	29	3
Post/paper forms	80	19	0
Website	42	50	7
E-mail	43	49	10

It is evident that people with no possession of the digital media required scarcely use government eServices. See Table 6 below. Apparently, public provisions in public buildings do not contribute much to the total use of these services. As revealed above, in this survey 21% of the Dutch population appeared to have no possession of a computer and an Internet connection and no experience with them. They are often called digital illiterates. To this number one should add approximately 15% of the population that formally does have a connection to the Internet but never uses it.

When we add 20 and 15 percent we reach a total of one third of the Dutch population that in fact has no access to government eServices as an individual citizen.

The difference between people with low and high experience of using the digital media in using government eServices is even more striking. See Table 6. The same goes for those preferring traditional channels of service provision and those preferring the use of websites and email.

However, the survey also shows that that while the Internet (both websites and email) are the most preferred channel of government service provision in the Netherlands, the telephone (29.7%) and the service desk (22.8%) are still the most frequently used channels, as compared to 18.4% for websites and 7.8% for email.

4 Conclusions

This article is based on a large quantitative (n=1225) study about the usage of online public services by Dutch citizens. Although the Netherlands is the country with the highest broadband penetration in Europe and a high usage of ecommerce services we must conclude that the actual usage of government eServices more moderate than we could expect. Despite the positive attitude of the Dutch population at large towards online government services, they are only moderately used. There is a big gap between actual use and intentional use. While the intention in terms of citizens wanting to use a service (if provided, when needed) is high; actual usage is lagging behind. This gap subscribes a large potential for future usage.

Especially for Dutch municipalities there is a lot to gain, mainly because the knowledge of the availability of services is very low. Probably this is a consequence of a supply side orientation to provision of online services. One cannot expect that simply launching these services on government websites without sufficient research for user needs and user behavior and without large scale information campaigns will be successful.

Table 7. High and low usage groups of eServices in the Netherlands compared

High usage:	None/little usage:
Employers, employees, unemployed, students	Pensioners, disabled, housewives/-men
Parents aged 30-45 years	Elderly people (65+, 55+)
Higher educated	Lower educated
Experienced with digital media	Inexperienced with digital media
Channel preference: digital	Channel preference: traditional

The main other factors described in this article to account for this gap are social and media characteristics. They reflect existing knowledge produced in digital divide research. We have shown that presently online government services in fact only reach two thirds of the Dutch population. These two thirds use these services to a very different degree. We have social categories with comparatively high usage and groups with low usage as summarized in Table 7. Citizens do not exchange traditional channels of service provision for electronic channels as fast as some government suppliers seem to think. Anyway, the objective of the eEurope 2005 program that

European countries “should have ensured that basic public services are interactive, where relevant, and accessible for all“ is far from being realized even a country with high Internet connectivity and a moderate number of electronic transaction services such as the Netherlands.

5 Discussion

While the focus in most existing literature is still on the availability of online public services, this paper covers the actual usage and the (non-)users of eServices. In this way some insights in the potential for future usage of online government services are produced.

However, some limitations should be noted. Not all available online public services have been measured. Compared to the number of available services, the number of services of municipalities investigated was low (only frequently used services have been measured). Further, it has not been the purpose of this report to present an inexhaustible list of variables and characteristics determining the gap between actual and potential usage. There are also other variables creating this gap, e.g. frequency of contacts with the government required.

We hope the findings of this report are encouraging for future research and for monitoring the usage of online public services in other countries and in other service fields. We also hope our research encourages fellow scholars and research funds abroad to investigate the situation in their countries, as we merely focused on the Netherlands. International comparative research in the field of actual and potential use of government eServices from a user or demand perspective would be very useful and inspiring. Unfortunately, current European, among others EU research mainly investigates the supply and the level of innovation of government eServices.

Future research should also focus on the underlying motivators of citizens to decide whether or not to use electronic government services. Why do they use some electronic government services more than others? When do they prefer traditional service channels and when do they choose online channels? What role does experience with certain government organizations play in using electronic services? Our results indicate that looking for a job vacancy can be very important driver in using particular electronic government services. Research will have to point out whether there are other motivators.

In the results of this survey we have observed the important role of computer and Internet experience. Therefore we strongly believe that digital skills also influence the take up of government services.

A lot could be learned from behavioural research: how do citizens use electronic government services? Do they easily find their way through government websites or do they get lost? How do they use search engines, electronic forms, and so forth and so on. How do they rate their experiences while browsing government websites? Are they pleased or do they get annoyed? And how do these experiences affect future usage? Both direct and indirect observations are needed to find the answers. Indirect observations are possible by means of key logging and website logging. Direct observations are possible for instance by camera observation and video analyses.

Ultimately, all the future research should address the one big question that really matters to practitioners such as policy makers and decision makers within government; namely how do they raise government eServices usage? The best way to answer this question is to turn to more user centered research, first of all of the actual use of eServices by citizens.

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Agriculture Market Information E-Service in Bangladesh: A Stakeholder-Oriented Case Analysis

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Abstract. This paper assesses an e-government project in Bangladesh using design-reality gap analysis and stakeholder theory. The project under study is an Agricultural Market Information System intended to provide timely and accurate market information to farmers, wholesalers, and retailers, for the purpose of making actors more informed and markets more effective. The research questions are; why did the system fail, and what, if anything, can be done to improve it. The analysis shows deficiencies in both adaptation to stakeholder preferences, needs and capabilities, as well as in project resources such as staff supply and qualifications. Yet the project has been technically up-to-date and has over time exhibited some learning as failures have resulted in adaptation to new findings. This research suggests use of mobile technologies in combination with call centres and locally available human resources as the most important factors for success.

Keywords: eGovernment assessment, Agriculture Market Information Service, stakeholder theory, gap analysis, electronic government, mobile technologies, ICT4D, development.

1 Introduction

eGovernment (eGov), more accurately but less commonly “eGovernance” [1],[2], refers to the systematic use of information and communications technologies to achieve better government by maintaining efficient, effective processes and by transform relations with citizens (G2C), businesses (G2B), and within government (G2G). This study concerns developing countries, and however similar in many respects as compared to developed countries these countries as a group are also quite heterogeneous [3]. Each society’s and government’s readiness for, and success with, eGov depends upon which objectives and specific sectors it chooses as priorities, as well as the resources available at a given point in time [4].

Interest in eGov is great in Bangladesh despite a very low level of Internet (0.04%) and PC penetration (0.09%). Under such a scenario, it’s a matter of great concern of how people would get G2C services even if they offered publicly, and clearly other delivery media than PC have to be considered.

The Government of Bangladesh has taken initiative through the Dept. of Agricultural Marketing (DAM) under the Ministry of Agriculture to implement a demand-side motivated system primarily for farmers, wholesalers and retailer to improve market performance through a modern agro-market information system. This system has met many troubles but is however still pursued. This paper analyses the trajectory of the system in view of stakeholder theory and gap analysis.

The paper proceeds as follows. After this introduction and the ensuing Methods Section, Section 3 reviews stakeholder theory. Section 4 describes the case, the market information system of the Bangladesh Department of Agricultural Marketing. Section 5 analyses the case using a gap analysis method, and Section 6 draws some conclusions for further work.

2 Method

The case study was conducted retrospectively from November 2006 to February 2007. Data was collected through semi-structured interviews with the concerned officials of the DAM, NCDP and other agencies involved in e-government in Bangladesh. A structured questionnaire targeting demand-side stakeholders – farmers, wholesalers and retailers – was also carried out in February 2007 with a total of 1050 respondents randomly selected from the three target groups, 350 in each. The respondents were geographically distributed across 13 out of 64 districts of the country; however as most wholesalers and retailers were located near or within Dhaka.

The questionnaire had eight structured questions, including six structured sub-questions and two open ended questions. The purpose was to explore behavioural and usage patterns, needs and characteristics of the targeted groups. The data was analysed using stakeholder theory and a design-reality gap analysis model developed by Heeks [6], which, while not exact, is useful for giving indications and which is also good for communication purposes.

3 Stakeholder Theory: Literature Review

The meaning of 'stakeholder' in the management and information systems literature is not straightforward [7]. There is some consensus on the identification of stakeholders of the firms and to whom or what managers pay attention [8]. Many definitions of stakeholders are based on the researcher's own perspective in a particular context. Stakeholder may be defined as an individual or group having legitimate and intrinsic interest in the process of achieving mission of an entity. Freeman [9] defines stakeholder as "any group or individual who can affect or is affected by the achievement of the organization's objectives". This definition is based on a private-sector for-profit organization where managerial attitudes, structures and practices require simultaneous attention to the interests of all legitimate stakeholders. Boddy and Buschanan [10] define organizational Information system stakeholders as "all those who have a practical concern for the effective application of new technologies, and who are in a position to take or to influence decisions about why and how they are used". Ahn and Skudlark [11] offers a broader Information system specific definition of stakeholder as "a group

of people sharing pool of values that define what the desirable features of an Information systems are and how they should be obtained".

Freeman [9] sees organizations as 'open systems' having a large network rather than as independent self-standing entities. Identification of stakeholders, interconnections among them and support from all stakeholders of the network are critical steps in projects. It has been evident that without effective relationships among the various components of this network organizations' objectives will not be achieved. Freeman [9] therefore identifies three levels in the process of managing organizations' relationship with stakeholders; identification of stakeholders, managing relationship and understanding the set of transactions with the stakeholders under a certain setting. This relationship of both primary and secondary stakeholders is built upon the pillars of interest backed by certain needs. Identification, manipulation and understanding the needs are the critical contemporary planning problems [12]. The rate of acceptance of project will increase if the attitude and expectations of multiple stakeholders are thoroughly investigated [13]. This investigation will also help to identify possible conflicting stakeholder groups which is critical to the benefit of the development and implementation of an Information system [14],[15].

According to Nutt and Backoff [16] and Bryson [17], there are four categories of stakeholders: Antagonistic and Supporter stakeholders are respectively hostile to and supportive of the organization's course of action and are very important to the organization. Problematic and Low priority stakeholders respectively oppose and indirectly support the organization's course of action but are relatively unimportant. Mendelow [18] identifies four possible types of stakeholders: highly predictable stakeholders with low power that present few problems, unpredictable stakeholders with low power that are manageable, powerful stakeholders that are predictable, and powerful stakeholders with low predictability that present the greatest danger or opportunity. Mitchell, Agle and Wood [19] and Tennert and Schroeder [20] propose a framework for stakeholder identification and salience by using qualitative attributes of power, legitimacy and urgency. Here salience is the degree to which managers give priority to competing stakeholder claims based on 'the principle of who and what really count'.

According to Dunn [21], "an approach to stakeholder theory based on feminist philosophy emphasizes a firm's responsibilities to all stakeholders instead of a conflict between the rights of shareholders versus the rights of non-shareholder stakeholders". This approach directs managers to be concerned with all legitimate stakeholders. Stakeholder theory categorizes from descriptive, instrumental or normative points of view [22]. A normative view which is the fundamental basis of stakeholder theory looks upon the firm from the outside and describes why firms *should* behave in certain ways and give consideration to their stakeholders in order to produce productive output for a broader community. On the other hand, instrumental theory which challenges the neoclassical economic theory of the private sector firm illustrates that certain outcomes are derived by certain actions of the firms for their stakeholders. It offers a framework for investigating the links between conventional firm performance and the practice of stakeholder management. According to this part, firms who are managed for optimal stakeholder satisfaction thrive better than those forms that only maximize shareholder interest [12]. Descriptive part of this theory describes that firms have stakeholders having cooperative and competitive but intrinsically valuable interests where managers actually response accordingly. Though most scholars agree that

ultimately stakeholder theory relies upon normative foundations [12]; however, Pouloudi [7] argues that an instrumental aspect seems to be more dominant as stakeholder approaches have been applied to assist both strategic information system planning, and information systems development, aiming to contribute to a better management of information system projects.

Stakeholder theory is primarily a management instrument attempting to describe, prescribe, and derive alternatives for private sector governance that include and balance a multitude of interest [12]. Whether or not Stakeholder theory can fruitfully be applied in the settings of public organizations or projects depends on similarity between public and private organizations. Contrary to the private sector, the public sector exhibits a high level of complexity having multiple sources of power and authority, multiple stakeholders with diverging and vague goal structure, responding to market failure instead of market needs, low level of transparency and accountability and inadequate concern about the equity issues [23]. However, these differences do not prove that important differences between them actually exist as they do not necessarily make a significant difference in terms of the skills and strategies a manager needs to operate the organization, public or private. Therefore, management practices and theories based on private sector may be adapted to fit the context of public sector [24]. Flak and Dertz [23] argue that " the apparent complexity challenge faced by public sector managers and the demonstrated ability of stakeholder theory to unveil and handle complex settings, create a strong argument for applying stakeholder theory in the public sector...[however]...a stakeholder based approach to IS strategy development in the public sector seems theoretically promising, it needs empirical validation".

4 Market Information System (MIS) at DAM

Bangladesh is primarily an agrarian economy, generating export earnings not only in farming but also by agricultural manufacturing sector [25]. Rural development has become a function of agricultural growth. But as there are many small farmers and less than perfect information for stakeholders in the sector, the market is volatile to manipulation and uninformed actions. Farmers' participation in market and transport management is so poor that most of the time they are being forced to sell their products to local middlemen at dumped prices. Under these circumstances, experts opine that this deprivation on part of the growers may greatly be reduced if they would have been empowered with information. The timely and unbiased agricultural marketing information helps farmers to bargain with the middlemen for a fair price and gain profitable decisions in the short term with regard to what price to produce and what price to expect [26]. In addition to farmers this information is also important to the wholesalers, retailers, consumers, ministry of agriculture, researchers and policy makers. Like farmers, wholesalers may have the opportunity to locate their profitable market whereas retailers can buy and sell their products at market prices from the wholesalers and to the customers respectively.

In the light of the above, Government of Bangladesh has taken a number of steps in order to disseminate agricultural market information to the concerned stakeholders, specifically farmers, traders, policy makers and the media. From June 2002 to December 2003, with the assistance of FAO, Department of Agricultural Marketing

(DAM) under the Ministry of Agriculture initiated a pilot project as named 'Agricultural Market Information Improvement' (AMII). AMII was running in 10 of the 64 districts in Bangladesh with the aim to improve food security by ensuring (1) more accurate and faster knowledge of price movements of agricultural commodities being available to policymakers; (2) improving capacity on the part of traders to identify trading opportunities in particular markets in short supply and to respond rapidly to those opportunities and (3) making the farmers able to make more informed, market-based decisions about what to produce, when to grow it and when to sell it and thus maximizing rural returns and minimizing post-harvest losses due to overproduction of certain crops. AMII was designed to provide a review of the existing Market Information System (MIS), with detailed proposals for changes necessary to meet project objectives; train DAM staff from field level and Headquarters in data collection, handling, processing, analysis and dissemination; computerize the Dhaka Headquarters of the DAM MIS section and the selected project areas and train staff in Windows and its programmes as well as in the FAO Agrimarket software programme; Communication between Divisional markets and Project areas facilitated; identify gaps in skills of field level officer and staff of DAM in utilization of newly available market information and training materials designed and provided; collection, collation and dissemination of international agricultural information for achieving the users needs and the policy makers for aggregate agriculture; try too establish Website in the Headquarters; and information dissemination through Radio and TV.

In this project district level wholesale and retail prices are collected daily and assembly prices are collected weekly. The daily collected prices are entered into a computer located in the district and emailed as attachment to the headquarters of DAM in Dhaka, where a database is compiled and reports are produced to be sent to all stakeholders. One of the methods of information dissemination was a website (<http://www.damdb.org/>) through which the information was accessible in three different formats, (1) a single column report, (2) a multiple column report allowing for easy comparison of prices per market, (3) an Excel file allowing data to be downloaded and manipulated by the user.

In 2002 under the Ministry of Planning, the Support to National ICT Taskforce (SICT) was formed to ensure access to information by every citizen to facilitate empowerment of people and enhanced democratic values and norms for sustainable economic development by using the infrastructure for human resources development, e-governance, public utility services and all sorts of on-line ICT-enabled services. One of the projects was 'e-Governance Application and Online Daily Market Price' at the Department of Agriculture Marketing under Ministry of Agriculture, implemented in 2006. The main difference between FAO's AMII and SICT's one is that the latter is an interactive and ongoing project whereas AMII was a static pilot project. SICT was assigned to expand the coverage of the existing MIS from 10 to 30 districts by equipping the Agriculture Office at each district with a stand-alone computer with Internet access to a web-based application to upload, retrieve and disseminate data; digitalize historical paper-based records of agricultural product market prices-approximately 350 volumes, each volume containing about 700 pages; creating an interactive webpage for public access to daily updated information on agricultural products, and train relevant personnel in data entry and retrieval, and administration of the entire system.

According to this new e-government initiative of SICT for DAM, the daily updated information on agricultural market information would benefit citizens in many ways. Agricultural traders can get valuable information on comparative market prices, farmers can maximize profits by making informed decisions about market situation, information can be disseminated to framers through TV and radio, and policy-makers and researchers can find out trends and impacts.

DAM's web portal (www.dam.gov.bd) provides both static and dynamic information relating to commodity-wise, variety-wise daily prices and arrival information of more than 1000 varieties and about 326 commodities from the wholesale markets spread all over the country. This portal is interactive, yet less user friendly in the context of the demand-side primary stakeholder since it does not use the Bangla (native) language. However, this site also provides prices and arrival trend reports for important commodities, commodity and market price search and generates reports with charts and trends by location, date, daily, weekly, yearly, comparison, increment and decrement.

According to DAM, so far 1000 markets have been provided with internet connectivity. DAM and its 64 District offices and four offices at the Paurashava (district municipality) level manage data collection from selected markets at the field locations under supervision of District Marketing Officers. An individual market centre enters the data in the prescribed format, using the customized application software connected with the DAM's web server. The data and information is recorded at these District and Paurashava offices under the overall management and administration of DAM head office located at Dhaka. The data once collected on daily basis are posted through the web server, is checked and compiled for final posting twice a day, except on market/public holidays, to the website.

Table 1 identifies the primary and secondary stakeholders of the MIS. While the project is initiated by the supply side, the design would be based on the parties involved in the demand side. Based on the history of the projects reviewed above, the three primary demand-side stakeholders were targeted with a questionnaire, to be presented in Section 4.1. Clearly DAM's web-based effort seems ineffective given the low ICT penetration. This situation created the idea of using mobile phones for data transportation, as access to the mobile telephone is already considerable and expected to increase 25% by 2010. Drawing on this development the Northwest Crop Diversification Project (NCDP) under the Dept. of Agricultural Extension of the Ministry of Agriculture has taken efforts to deliver such services to the targeted stakeholder through rapidly increasing mobile phones in Bangladesh. With the assistance of the Asian Development Bank (ADB), NCDP was formed in January 2001 with a mandate until 2009 aiming at alleviating poverty in the North-west region (16 districts and 60 sub-districts) of Bangladesh by increasing income and employment through cultivation and diversification of High-Value Crops (HVCs). NCDP has taken initiative to a nationwide mobile phone based MIS with the objectives of collecting, collating and disseminating market information by which NCDP targeted beneficiaries (farmers/retailers, wholesalers, researchers) will be able to prepare effective production and business plan to attain good income through selling their HVCs, establishing a public, NGOs and private sector partnership, and improving nationwide market implementation flow system by which marketing system of HVCs will be a bit organized, streamlined and disciplined.

Table 1. Demand and Supply side of the Primary and Secondary stakeholder of DAM's E-government Initiative

Demand side stakeholders		Supply side stakeholders	
Primary	Secondary	Primary	Secondary
Farmers	Agro-manufacturers	Policy makers	IT vendors and operators
Wholesalers	Media	Ministry of Agriculture	Creditors
Retailers	Researchers	Dept. of Agri Extension	Donors
	NGOs	NCDP & their partners	NGOs
			Kiosks
			Media

The public (Dept. of Agricultural Extension - DAE, DAM, Local Govt. Engineering Dept. - LGED), NGOs (Bangladesh Rural Advancement Committee- BRAC, Proshika, Grameen Krishi Foundation –GKF, Rangpur-Dinajpur Rural Services – RDRS) and private sector (mobile companies) were proposed to work jointly for establishing such a Market Information (MI) flow system by which NCDP beneficiaries will be benefited through easy access to MI in time and utilize those in preparing effective production and business plan to attain fair market price of their products.

4.1 Results of Survey to Stakeholders

In order to examine the effectiveness of the current e-government initiative of DAM as assisted by the SICT of the Ministry of Planning and to understand the behavioural trends and profile of the demand side stakeholders, a random survey among 1,050 respondents having 350 samples in each category (farmers, wholesalers and retailers) has been conducted in 13 districts of the country. The survey also investigates the opportunities of the proposed NCDP mobile phone initiative.

Table 2 shows that the level of satisfaction with current prices is about 20% lower among farmers than among wholesalers and retailers. IT also shows that farmers would be very willing (80 %) to sell in other markets, indicating at least a great potential for better market information to improve their situation. Wholesalers and Retailers would be less interested; however still quite interested. Wholesalers and retailers are significantly more acquainted with the internet than farmers (Table 2). Very few farmers have at all heard about the Internet, and only just over 1 % has heard of the DAM portal. The numbers for wholesalers and retailers are higher but still low, 12 % and 8 % respectively. Clearly this dissemination channel is less than effective.

Computer use on part of farmers is very low (3%). There is also a correlation between the level of literacy and the use of ICT (Table 3). Table 2 shows that there is considerable access to mobile phones, even though, again, farmers score significantly

Table 2. Stakeholders' responses to survey questions. Figures in % answering Yes.

No.	Questions	Farmers n = 350	Wholesalers n =350	Retailers n=350	Cumulative n =1,050
1	Are you acquainted with the words 'Web-site/Internet'?	22	56	53	44
2	Have you ever used a website?	0.09	11	6	6
3	Have you ever heard of DAM's e-gov portal ?	1.43	12	8	7
4	Have you ever used a computer?	3	25	22	17
5	Do you have (a) mobile phone(s)?	25	68	46	46
6	Are you acquainted with using SMS?	8	47	33	29
7	Are you satisfied with the price of your commodities?	41	64	63	56
8	Would you sell your products elsewhere where you may expect to receive more profits?	80	68	59	69
9	Would you use a service provided through mobile phones for getting market information?	58	90	80	76

Table 3. Stakeholders' education profile. Figures in %.

No.	Categories	Farmers n = 350	Wholesalers n =350	Retailers n=350	Cumulative n =1,050
1	No formal education	40	11	18	23
2	1 st to 10 th class	50	52	58	54
3	SSC	7	21	15	14
4	HSC	2	12	8	7
5	Graduates	1	4	1	2

lower than the others. According to the Table 4, there is a distinct difference in media preferences. While farmers clearly prefer physical contact, radio and TV, both wholesalers and retailers rank mobile phones highest. The DAM web scores lowest. These figures correlate with access to the technology, indicating that the weakest actors in the field are also less interested in new technology, and perhaps some mixed-media solution such as call centres would be most effective for them.

In summary this analysis shows that even if mobile solutions, as proposed by the recent NCDP initiative, may be clearly more effective than the earlier web based solutions, there is a need for some human agent, possibly a call centre solution.

Table 4. Stakeholders' preferences of using media for accessing market information. Figures in % answering Yes.

No.	Categories (rank order questions)	Farmers n = 350	Wholesalers n =350	Retailers n=350	Cumulative n =1,050
1	Mobile phones	17	39	35	30
2	Physical presence	31	21	21	24
3	Reference from others	28	15	12	18
4	Radio and TV	20	12	17	16
5	Printed media	3	10	13	9
6	DAM's current portal	1	3	2	2

5 Gap Analysis

According to Heeks [27], performance of e-government project depends on the size of gap between current realities and the design of the project. This gap is analysed in seven dimensions; Information, Technology, Process, Objectives and values, Staffing and skills, Management systems and structures, and Other resources – time and money (ITPOSMO). While the variables are widely recognised as central, clearly the measurements are only rough estimates based on insufficient and disparate information; however as the model is useful for communication it has been frequently used as a reasonable framework for estimation. The outcome of the model is a gap estimate, the larger the gap the greater the risk. Now follows our assessment of the DAM initiative, based on the information presented above, using the ITPOSMO dimensions.

Table 5. Summary ratings of the DAM initiative along the ITPOSMO dimensions. Explanation in the text.

Success (no gap)				Partial success				Failure (radical gap)			
0	1	2	3	4	5	6	7	8	9	10	
				P, O	I	S, M	O	T			

Information: Requirement analysis was carried out without survey and the design assumed that the Market information would be of value to the targeted stakeholder. In reality, despite standard level of interactivity and capacity of generating reports, information was not effective due to absence of native language. Also, only 7% of the total respondents had heard about the DAM portal. Of them, only 6% had the ability to access websites. Gap score: 5

Technology: The design assumed all Agriculture Offices be computerized and having access to the web-based application to upload, retrieve and disseminate data. It also assumed that on the demand side, targeted stakeholders would access the portal through the internet. In reality there was lack of internet connectivity and maintenance and many computer systems in the rural districts were most of the time found down. Further, only 3% of the farmers had access to computers and almost none of them had internet connectivity. Kiosks in rural areas, like GrameenPhone's 483 Community Information Centers (www.gpcic.org) may contribute to increasing access. However, it

has been noticed that the farmers are reluctant to visit those kiosks due to long distances. Hence, call-centre services could be an effective solution not yet explored. Gap score: 8

Process: The system design assumed data be uploaded in a decentralised manner through a web application and be from errors. In reality data must be checked centrally before posting them to the portal. Also, sometimes the portal is down because of systems administration problems not expected initially. Gap score: 4

Objectives and values: The design assumed that the objectives of the project – i.e. to provide red tapism-free citizen-centric services in particular to disseminate agro-information to the farmers, traders, policy makers and researches and to maximize profits of the farmers – were shared by all stakeholders. In reality, few but the senior officers of DAM and NCDP were aware of these objectives. Even the value of disseminating agro-market information through the modern technology was not well understood, as we have shown above. Gap score: 7

Staffing and Skills: The design assumed that sufficient supply of competent staff would be available at the various levels of the system and there would be backup supports. In reality, all districts but Dhaka lack competent IT professionals. ‘One man for one system’ in the rural districts and inadequate networking knowledge make the project inflexible to run in the integrated manner envisioned. Gap score: 6

Management Systems and Structure: The system was designed to be decentralized under close technical supervision, flexible and having an integrated decision making system. In reality, autocratic, hierarchical and centralized mind settings and leadership isolated the management systems and structure. Gap score: 6

Other resources: The design required uninterrupted flow of funds for maintenance, training, development and promotion, as well as considerable efforts by senior and middle rank officers during the planning, implementing, and operations of the system. In reality, though there seems to have been adequate devotion among the concerned personnel, lack of funding for immediate maintenance has hindered smooth operations of the project. Gap score: 4

The above analysis results in a total gap score of 40, indicating that DAM’s present e-government initiative has been a partial failure and will fail totally unless action is taken to close design reality gaps. As the scoring clearly is not an exact science we have used what we believe to be a conservative scoring to avoid over interpretation of data which is incomplete anyway. For example, the extremely low internet access and literacy among farmers might invite a 10 score on “Technology”. However, we have interpreted the positive signs we have seen, such as the existence of servers, a contact network in the districts etc as at least a reasonable precondition for building a more adequate system upon the lessons learned so far and the rudimentary facilities that after all have been created.

6 Conclusions

We have used stakeholder analysis and a gap analysis technique to assess an eGovernment project crucial for almost all developing countries – providing information to

improve internal agricultural markets. The study concludes that the current eGovernment initiative of DAM is neither fully successful nor sustainable. Despite having clear objectives and adequate support at the initial stage, the project has so far clearly failed to consider the realities of the targeted demand-side primary stakeholders. Hence understanding of these is one important approach, and we have provided some knowledge to this end. We have also shown that stakeholder theory was useful to understand the situation.

Our gap analysis shows that even though objectives and resources were at least reasonable, design-reality gaps in technology use and access, and local resources were very large and the main reasons for failure. We also showed that simple gap analysis, however inexact, can take us quite far in understanding the problems in the situation.

As for how the situation could be remedied, our investigation points to two important opportunities. The first is that mobile technologies should be employed; this technology is already much used among demand side stakeholders, and it would likely be even more used if information relevant to the actors in the sector would be distributed this way. For example, 80 % of the farmers say they would sell at other marketplaces if they had the opportunity. Timely and accurate information about prices is one important ingredient in this opportunity, and one they presently lack.

The second point is that technology has to be complemented with making human resources available and integrated at the local level. Farmers value physical contact highly, also, local data input is a critical success factor. Our survey indicates that a combination of mobile phones, call centres and local resource persons could be the key to success. Such resources might be a “village phone lady”, hence drawing on an already available infrastructure.

In conclusion we believe that although the project has a long history of failures, there is still hope provided mobile telephony, local human resources, and integration between the government system and e.g. NGOs or local business such as the village phone system together – not any of these alone – are moulded into a smoothly operating system. This means seeing the project as one of eGovernance rather than eGovernment.

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Interpreting E-Government: Implementation as the Moment of Truth

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Abstract. The dematerialisation of the document flows received and sent by the public administrations (PAs) is one of the main cornerstones of the Italian e-government programme. The empirical data relative to the diffusion of the new document management systems reveal that today less than half of Italy's central PAs have attained an adequate level of project advancement in terms of the Computerised Correspondence Register (the system whereby each document is automatically filed and retrieved), despite the fact that the deadline for compliance was 1 January 2004. The paper develops a number of reflections to understand the idea of change that guided first the legislator and then the monitoring authority. The thesis advanced is that also when implementation seems problematic, the rhetoric of managerialism dominates the e-government discourse. Through our reconceptualisation we argue that e-government reveals its organisational implications only when the statements of principle are translated into concrete actions and decisions.

Keywords: e-government research, e-government implementation, document processing, public administration, organisational change.

1 Introduction

E-government is perceived as the latest trend in a set of market-driven reforms launched by many governments since the early 1980s [18, 19, 27]. Most OECD countries have formulated ambitious action plans for implementing e-government. The aim is to move service delivery to the World Wide Web, to enhance information to citizens and to make public-sector workplaces smarter for the benefit of citizens, politicians and civil servants alike [21].

e-government is a typical example of IT-enabled change where, up to now, the effective results have been quite variable (according to [20]: “the expected payoffs from automation have been slow to be realized”) and “over-enthusiastic rhetoric has often been substituted for clear thinking” [10].

The rhetoric informing current governments reform efforts can be traced to the widespread decision to transpose and use the models and practices typical of the business community [1, 9, 7]. e-government managerialism - according to ([3], p. 272) - can be summarised as follows: a concern with the “efficient” delivery of government information to citizens and other groups of “users”; the use of ICTs to

improve flows of information within and around government; a recognition of the importance of “service delivery” to customers”; the view that speeding up information provision is, *by itself*, “opening up” government (...). ”

Within the managerial model, the rationale to invest in e-government is provided by increased efficiency and savings in administrative costs [19]. There is an assumption that (public) managers are capable of exploiting technology in coherence with the goals and are able to steer the organisational change as they please. The dominant response to contradictory outcomes and the frequent failure of programmes to achieve their intended effects consists of the argument that failure is a function of lack of management competence in the use (or awareness of) managerial techniques. An alternative view is one that emphasises the structural constraints on management practices. On the other hand, the latter position suggests that management’s room for manoeuvre is limited.

At this point, the question that springs to mind is: given that the actual success of the models inspired by management practice (often referred to the New Public Management, NPM) is anything but a given in public service organisation, how can we explain the assumed superiority and attractiveness of these models on the ideological and cultural front? [8] (p. 7) argue that the appeal of the NPM lies in the claim that it delivers improved public services and that it represents an empowerment of those it employs and those it seek to serve. The first strong reason of success is that management practices from the business community are considered to be superior to those of the public sector [2]. According to their supporters, the managerial prescriptions have the merit of forcing bureaucrats to become managers, to look ahead towards the effects of their actions, instead of always looking backwards to the conformity of their statutory acts. The second reason for the success of business methods has been further strengthened by the development of ICT. The diffusion of DBMS, the fourth-generation languages and application packages offering multi-dimensional analysis and control systems (e.g., CRM, Customer (or Citizens) Relationship Management), make the decisional techniques - which yesterday seemed overly complex due to the high number of variables involved or the quantity of data to explore - appear more realistic and manageable.

This article addresses the theme of e-government implementation, highlighting the inherent problems. Unlike the contributions that seek to identify appropriate indicators or factors of success in e-government projects (for an interesting review of the literature on these themes see [22]), this study aims to demonstrate how the e-government discourse, also in those cases in which implementation has led to disappointing outcomes, is pervaded by a good dose of managerial rhetoric [6].

Our research approach looks at the bigger picture in order to analyse the recent experience of Italy’s central Public Administrations (PA) in implementing the national e-government plan for de-materialising documentation flows. The business of archiving and classifying documents – under the scope of the so-called Computerised Correspondence Register (CCR) – takes on an essential role in achieving the transparency objectives of the administrative action. Based on the latest periodical survey carried out by the independent authority (CNIPA, the National Centre for the Computerisation of the Public Administration) to assess the progress of the “CCR Project”, the paper wants to offer a contribution to understanding the idea of technological change as envisaged by the Italian e-government programme. As

[27] underscores: “It is vitally important that we have a clear conceptual framework for the analysis of e-government”.

The theme of document management takes on special relevance due to its pervasiveness – no public administration, either central or local, is excluded – and economic importance. CNIPA’s estimates point to 160 million incoming and outgoing documents in solely the Italian central PA. In addition, the estimates indicate that if the public administrations were to fully use the CCR, then postal franking costs alone would be cut by €60 million. Nevertheless, despite the fact that the use of the digital correspondence register has been compulsory since January 2004, the state of implementation in compliance with the requirement has been defined by CNIPA itself as “insufficient and inadequate”.

In the pages that follow, we will first provide an overview of the salient contents of the national project and the methods used by the 61 subjects making up Italy’s central PA to implement it. We will then look at the prevailing interpretive key adopted by the work group mandated to monitoring the activity and highlight its limits. In parallel, we will try to show how the managerial rhetoric fails to help us adequately interpret the situation in the Italian PA in terms of organisational change. The interpretive key proposed by the paper stands out from the mainstream in terms of its specific contents, but above all, its conceptual assumptions. Our reinterpretation is based on some alternative theoretical proposals. The treatment of the Italian case draws on data from a number of public sources: official documents, reports, conference papers and various online materials. The paper ends with our summary and conclusions.

2 Case: Redesigning and De-materialising Document Flows

In the sphere of the e-government development plans promoted by the Italian authorities, the computerised correspondence register (CCR) is part of a far-reaching project to redesign the administrative action and facilitate public sector reform. Indeed, according to the legislators, the CCR is not a mere tool for automatically encoding the incoming and outgoing documents, but the cornerstone on which to implement the principles of efficacy, publicity, transparency and accountability in line with the public administration’s strategic development and rationalisation goals.

The regulations establish that all the Italian administrations must upgrade their information resources and organisational practices by 1 January 2004, to enable the introduction of the new electronic systems. The legislators, despite requiring the administrations to implement the CCR within the “minimum nucleus” – which means solely the part that automates the marking and registration of the document – actually indicated a more ambitious goal, seeing that as early as 2000 they were talking about computerisation not limited to the initial phase of the incoming document, but extended to the whole of the procedure’s lifecycle.

The Italian government has mandated the monitoring of the project to an Authority called the National Centre for the Computerisation of the Public Administration (CNIPA). In 2002, CNIPA established a special Competence Centre to function as the reference point for the entire PA, but also gave it other functions of guiding and supporting the implementation of the register. At the time of writing this paper, the Competence Centre had conducted two fact-finding surveys, for which it prepared a

questionnaire to gather “information useful to assess the level to which the central PAs have achieved the objectives called for by the law” ([4], p. 79).

2.1 Levels of Diffusion

The following data refer to the situation as at 30 April 2005 in all 61 central public administrations. Overall, 82 surveys were conducted in the same number of organisational units. The aggregate number of employees working in these structures was about 650,000.

We make the distinction between the CCR and document management because the level of implementation and use of these two types of ICT solutions differs significantly. In terms of the CCR, 34 administrations had reached a good level of diffusion, with the system handling just short of half of the overall documentation volume managed; 17 administrations had just completed the technical project and had implemented solely a pilot office; a further 17 were still in the project development stage; and a good 14 had not yet gone operational. However, document management lags even further behind, seeing that 55 administrations had not yet planned any operational move, 27 had already come on stream, but of these 15 – excluding the six that have reached a level of document filing and management of around 80% and the other six that had reached between 20% and 80% - which account for 60% of total volumes managed, had reached a computerised filing level of less than 20%.

The documents registered electronically as at April 2005 accounted for about 40% of the total and the forecast for June 2006 was 60% of the total documents managed. While this is an important jump, the administrations are still a long way from achieving the widespread diffusion that one would expect, given that the legal deadline for this type of functionality was 2004. The situation of the electronically filed documents is even poorer: 23% in April 2005, estimated to rise to 37% in 2006.

Table 1 shows the distribution of the projects and/or the services implemented by the administrations relative to the functions deployed (one individual project can cover one or more functions). Roughly 85% of the projects in question have implemented the minimum nucleus of the CCR, of which 13% in the form of ASP (Application Service Provisioning). Just over 42% of the projects centre on document management functions, of which, 2% in ASP mode. Some 31% of the solutions used perform workflow management functions. Around 13% of the active systems incorporate administrative transparency functions and about 32% offer CCR interoperability functions.

The data outlined in Table 1, below, relates to a total of 111 projects/services.

Table 1. Distribution of the Computerised Correspondence Register by Type of Solution (Source: [4])

Functions	Number of Projects/Services	% Projects/Services
Computerised Register (CCR)	94	84.7%
Document Management	47	42.3%
Workflow Management	34	30.6%
Administrative Transparency	14	12.6%
CCR Interoperability	36	32.4%

But what are the reasons for this problematic situation? According to the CNIPA questionnaires, the administrations' more frequent criticism was the lack of financial resources to dedicate to the project, while other delicate aspects underscored in the responses included the technical difficulty of implementing systems with adequate levels of security and reliability. In addition, the PAs also cited problems related to the integration of document management (which is a typically horizontal process, meaning that it crosses the entire organisation) with the vertical legacy systems. The information gathered from the monitoring process also reveals difficulties such as defining the requirements of the new system, project duration (still an average of three years from definition of the specifications to effective implementation) and in organisational planning (staff training, infrastructures, implementation documentation, etc.). Other cases cite the further problem of harmonising the new system with existing operating practices. In short, Italy's central PA is still far from that widespread use called for by the law in force.

The monitoring group's last report says that a specific law was enacted far in advance (starting 1998) to enable the administrations to respond within the deadlines established and to give the suppliers time to develop adequate technological solutions to meet the needs expressed by the administrations. Moreover, CNIPA made various kinds of operating tools available – including turnkey solutions like ASP – to accelerate the implementation of the CCR, also by those administrations with fewer resources to invest. But all this has not been enough because, more than two years after the enactment of the law, the level of implementation – in terms of both the general implementation of the programme and the operating volumes managed electronically – remains far below expectations. The situation is even more surprising if we take into account that this concerns the implementation of what [11] define as the 'mandatory solutions due to legislation, where there is no option but to proceed'.

2.2 The Evaluation Model Developed by CNIPA

In this section we will look at the evaluation model developed by CNIPA from a closer angle, not merely to describe its contents in detail, but to get the full picture drawn by its inspirational logic. In general terms, we can say that CNIPA has identified a number of factors (Fig. 1) it believes essential for the purpose of implementation, which are: the level of implementation of the electronic document management requirements, the effectiveness of the projects and/or services developed and the project risk levels. The model also comprises two other "functional" indicators related to each of the administrations analysed, that is: the organisational complexity and the level of general computerisation.

In addition, the model envisages two indicators of the compound type:

- Implementation effectiveness (computed based on the indicators: "Project Effectiveness" and "ASP Effectiveness"); and
- General criticality (worked out based on the indicators "Contextual Complexity" and "Project Risk").

The indicators making up this system all share a common denominator in their measurability. Indeed, each factor can acquire a value on a scale of 1 to 5 and each administration responding to the questionnaire was asked to indicate its position for

each indicator. CNIPA plans to use this methodological approach to facilitate the computation and comparison of the results in line with a number of criteria – by category and size of administration, by type of technical solution, by functionalities implemented, etc. In addition, the model makes it possible to follow the temporal evolution of the projects as these proceed at the national level in terms of resources absorbed, processes launched, number of homogeneous organisational areas (AOO) affected by the project, products supplied, number of staff assigned to the registration activities, results achieved and so forth.

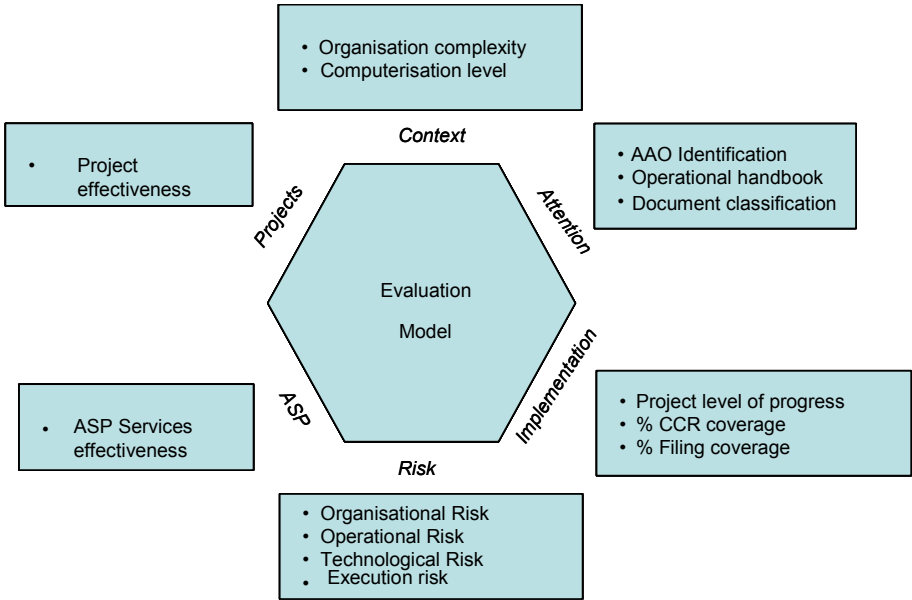


Fig. 1. The CNIPA Evaluation Model (Source: [4])

To sum up, the model developed by CNIPA embeds a simple one-directional causal model which links means and ends. CNIPA traces the effective implementation levels of document management solutions to the values given by a series of (static) indicators in relation to each central PA unit. The differences encountered between one context and another are then traced to the diverse weighting represented by each parameter, in other words, to the failure to comply with the legislative provisions.

3 Interpreting Organisation Change in PA Settings

At this point, it is interesting to reinterpret the snapshot provided by the CNIPA report in terms of the theoretical comparison. We will use this comparison to try and clarify why the evaluation model adopted as part of the project monitoring process is unsatisfactory, inasmuch that it does not help us to correctly interpret the highly mixed empirical evidence that characterises Italy’s central PA. In other words, the

model does not seem to be able to explain why the same regulatory framework, along with the same requirements for ICT artefacts (i.e. the document processing solutions), can lead to different outcomes in different as well as in similar organisational settings.

Our interpretive approach will use the contributions found in organisational literature and especially the suggestions offered by three different theoretical frameworks: the contingency theory approach [13]; the transaction costs theory [28] and the theory of organisational action [26, 15]. While we do not have room here to fully describe or reconstruct the specific nature of the cited theoretical proposals, the reader can use the bibliography to refer to the original texts cited.

3.1 The Contingency Theory Approach

In line with the contingentist view, the model developed by CNIPA represents a “a complex set of interrelationships among internal organizational states and processes and external environmental demands” [13]. It reflects a kind of ideal pathway that should lead the administrations to adopt – in a logic of adaptation – the technological and organisational provisions called for by the law on the management of document flows. The basic problem addressed by this model is that of implementation and compliance with the regulatory requirements. The differences resulting from these regulations and the concrete reality, in fact, are placed in relation to a number of variously determined factors. Nevertheless, it is clear that the number of variables taken into account is limited to a few elements, for which, moreover, we do not know their weighting in relation to other elements not included in the model.

The contingentist view also takes into account the role attributed to staff training. The CNIPA report ([4, p. 19) correlates the slowness of the CCR’s diffusion within the PA with the low percentage value (lower than 5%) of staff involved in training activities, as well as underscoring the modest “22% of fully implemented training programmes” (ibidem, p. 63). And again (ibidem, p. 59): “The (...) preparatory training of staff for the effective implementation of the CCR (...) must be considered an *implementation condition* of the new processes (our Italics, editor’s note) (...). For this reason, the analyses of the effective state of the training activities are efficacious indicators on the general state of the application of the law”.

On its own, the meticulous scanning and the extreme formalisation of each step in the implementation of the e-government plan should help the administrations identify the actions required. The law prescribes that the administrations implement a group of solutions, establishing in a binding manner the time horizon for introducing the document flow management systems, but at the same time leaving “each administration to choose which organisational method and technology solutions to adopt”. In practice, the CNIPA model significantly simplifies (by reduction) the scope for technical-organisational options and the correlated implications. Management is asked to deploy a number of resources in a scope that, in reality, is well pre-defined.

For example, the law requires that the public sector managers identify which of the offices in their respective structures should be assigned to deal with either the single or the coordinated management of documents for large homogeneous organisational areas (AOO), ensuring the adoption of the same classification and filing criteria as well as the internal communication between the same areas. The law also clarifies that - in addition to improving internal efficiency - the document processing tools must enable the citizens,

the companies and the other administrations to access the state of the procedure and the relative documents. In addition, for all this to come about (interoperability), the different administrations must use standard languages and communication protocols in conformance with the special technical specifications issued at the time by CNIPA. The interoperability concept indicates the possibility for the incoming CCR system of one administration to deal automatically with the information transmitted by the outgoing CCR of another administration, with the goal of automating the underlying processes and activities.

The complex issues of change – think only of the problems involved in coordinating the offices, sharing information and knowledge, and consolidating the new organisational routines – remain in the background. As we can see, the main question for the interested administrations is reduced to finding the best combination between the given factors, in line with predefined criteria. If an administration's internal states and processes are consistent with the “external demand” (i.e., legal requirements), then the CNIPA model suggests that it will be effective in dealing with its environment.

3.2 The Transaction Cost Theory

The transaction costs theory is the second framework that can be used to interpret the case in question. This theory [28] is widespread also in business practice to address all those problems that, directly or indirectly, presume relations of a contractual type. It is a well-known conceptual framework that centres on the need for the organisations to economise on transaction costs.

Let us return to the Italian case and take a specific look at the role of the technologies. The CNIPA model counts ICT as a “qualifying factor” that, therefore, enables each PA to structure itself appropriately to gain the highest possible benefits – in terms of effectiveness and efficiency – from the solutions implemented to comply with the law. The empirical data show that the implications of adopting document processing systems on the transaction costs are ambiguous. Indeed, on the one side, the 2006 report indicates an overall recovery in efficiency, given that the implementation of the AOO was accompanied by a downsizing effect, in terms of the reduction of the total number of structures allocated to the CCR process – which have shrunk from 18,944 to 15,326 – as well as a reduction in the number of employees assigned to the registration activities. On the other, the same report underscores that the ASP mode – which, at least on paper, offers significant advantages in terms of transaction cost savings – is an option that continues to be little diffused among the administrations.

This ambiguity is due to the simplified representation of the reality locked into the regulatory framework and the evaluation criteria adopted by CNIPA. The legislator wanted to stimulate the individual PA to introduce “transversal” criteria into their traditional organisational structure by function and reduce the “crossing time” of the information. The reasons are clear. The introduction of standard communication methods – implemented through advanced protocol and workflow management solutions – promises the implementation of a “low-cost” coordination (that is, without the need for direct relations) between the various subjects, inside or outside the administration. Nevertheless, it would be deceiving to think that the generalised use

of a new technological platform on its own – even though imposed by special regulations – could ensure the effective and concrete cooperation between the different offices or even between the different PAs. As indicated clearly by [12] concept of interoperability does not concern the mere physical connection of networks, technological platforms, software applications and data (in this sense, these authors use the effective expression “digital plumbing”), but actually requires specific interventions in the organisational coordination and control mechanisms. In addition, we need to consider the fact that the same administration often deploys various forms of document management – from the more traditional to the electronic. These tools (in potential conflict) increase the organisational complexity and certainly do not help reduce transaction costs.

3.3 The Theory of Organisational Action

A theoretical perspective that puts the emphasis on processes of action and decision [26] offers an interpretive framework for the “CCR Project” that underscores the diverse implications. In particular, the theory of organisational action (TOA) focuses on the processes of design, adoption and use of the computer artefacts [14, 15, 17].

If we treat the organisation in terms of “organising action” we can highlight how the introduction of electronic document management solutions in Italian PA transcends the “boundaries” of the individual administrations. Planning and implementation lose their connotation of discrete activities – that is, defined once and for all – to instead become processes distinguishable purely on the analytical level and that are carried out without solutions of continuity. The focus on the processes of action and decision enables us to trace the concrete implications encountered by many administrations in implementing the CCR Project not so much to contextual variables, barriers or general phenomena of “resistance to change” but, conversely, to the outcome of the bounded rational processes of action and decision [24].

The TOA approach recognises and addresses the problem of transactional efficiency but in no case can it be considered the only guiding criteria in the choices of organisational planning. The search for “critical success factors”, typical of the contingentist approach, thus leads to the analysis focus on organisational choices. In this way it is possible to capture the ongoing interactions of processes at the different levels. Coming back to the CCR Project, the provisions that oblige the PA to establish AOO and to ensure what is called administrative transparency acquire importance in that these are connected to the organisational regulation, i.e. coordination and control processes. Implementation is no longer the mere execution of the prescriptions issued from above, but becomes coordination between several subjects, each with their own resources, constraints and logics of action. This non-deterministic key enables us to interpret the choices that have led many Italian PAs to tackle the CCR project by circumscribing the extent, or by limiting themselves to implementing simply the document “marking” functions. In other words, the dialectic relation between formal and informal rules of regulation can lead to diverse courses of action: compliance with the norms or, vice versa, delays or conflicts. The whole of which fits into a framework of possibilities that are neither optimal nor predictable.

4 Summary and Conclusions

In this paper we argue that the rhetoric of managerialism continues to frame the implementation of e-government projects. This rhetoric proposes an unacceptable simplification of the organisational discourse. It is not hard to spot the presence of firm determinism in the current debate, which assigns a prominent weighting to the technological component. The implicit assumption is that a technical solution with optimal characteristics will intrinsically ensure the attainment of the desired results, or of the organisational “one best way”. Therefore, according to the mainstream, the basic problem of e-government lies in the choice of the “right” ICT system (e.g., between the diverse document processing or workflow management solutions).

By affirming that technology is the “driver” of modernisation in the public administration, CNIPA ([5] p. 5) assumes that organisation and technology are two separate and reified elements. As noted by ([16], p. 365) “if we keep seeing technology as “something” separated from the organisation, we still remain within a deterministic or co-deterministic frame”. In addition, this separation leaves unsolved the problem of explaining why - despite the high level of standardisation of the technological solutions, the relative ease of their acquisition and their low cost - we can still observe, after more than three years since the CCR law was enacted, significant delays and differences in the use of the new systems, even between administrations with similar features.

This paper has sought to overcome the dominant rhetoric by shifting the focus to the conceptual aspects. We have used some of the proposals found in organisational literature to reinterpret and comment on the Italian case. We have drawn upon the theoretical contributions that presuppose the need for the organisation to adapt to contingent factors, such as: changes in the law, different environmental conditions, technological features, the minimisation of transaction costs, etc., as our interpretive starting point in analysing and discussing the situation of the Italian central PAs. We then proceeded in a similar way to adopt an alternative approach (theory of organisational action, TOA), which has provided us with numerous ideas for reflection. This direction sees technology not as an external factor that “propels” organisation change in specific directions, but as an organisational choice itself.

After reading the CNIPA reports, we can see clearly that the focus has been placed almost entirely on the planning process. It has also emerged that CNIPA has assumed that the adoption of the new practices by the PAs would happen “naturally”, that is, based on the regulatory requirements and the opportunities offered by the technological tools, their relative accessibility and ease of use. The misalignments and mixed empirical evidences that characterise the Italian scenario have been read not as a manifestation of discretionary margins that are anyway insuppressible in complex organisations, but as preconceived resistance and opposition to the change [6, 7, 23].

Adopting an alternative stance, the reasons for the lack of CCR diffusion must be looked for in the decisional processes of *planning*, *adoption* and *use* of the technological artefacts. Viewing e-government as a process primarily means sustaining that its identity is revealed only when the statements of principle (e.g. in the form of regulatory norms and plans) translate into concrete actions. The proposed interpretive framework enriches our knowledge of e-government implementation not

only for Italy but also for other contexts. It can be adopted for empirical investigations and also to evaluate e-government programmes.

Ultimately, we underscore that the study does not intend to diminish the importance of the e-government development strategies. Nor do we wish to draw a veil of pessimism or cynicism over the great hopes that accompany its realisation. The CNIPA model is unquestionably useful for capturing some general trends and recording the state of progress of the CCR project, but even so, it cannot be deemed a generalist interpretive key for all the administrations involved on this front. Instead, as suggested by [25], in the future it would be desirable to undertake a full analysis of the costs and benefits of such a scheme.

At this point, the reflection moves away from the Italian case to launch a consideration with a much larger claim of validity: when the suggestions for developing e-government are cast off from that particular type of knowledge that an approach such as that proposed here can give, even the most obvious advice can turn into an obstacle, instead of a resource. The main thing is not to lose sight of the fact that the best managerial intentions can become the worst solutions to the problems, also in the field of e-government.

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Selection of Appropriate Payment Methods for E-Government – Model and Application

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Abstract. Not only in e-business but also in e-government, the success of online services liable for costs often depends on the convenience of the payment process. To find out the most suitable payment methods for a given e-government service, the authors develop a methodical approach for e-government decision makers. The multi-dimensional decision model takes into account various requirements such as security, economic efficiency, and specific requirements for the e-government service in question. The following paper illustrates the decision model with the case of the statistics shop of the German federal statistical office. A sample of payment methods is analysed and evaluated according to different criteria. Then, the most suitable payment methods for the online statistics shop are selected in accordance to the decision model.

Keywords: e-government, e-payment, decision model.

1 Introduction

The market for payment methods is very complex and dynamic [1] [2] [3] [4]. Especially new payment methods based on electronic media emerge and disappear at a high pace. In order to get the best possible payment solution for e-government services liable for costs, a multitude of existing and upcoming payment methods have to be considered in the decision process for e-government services. Each method features different specific requirements, strengths and weaknesses. On the other hand, online transactions also differ in certain criteria which might be against or in favour of the use of certain payment methods.

The aim of this paper is to identify the criteria which are to be considered in the selection process for the most suitable payment methods. On that basis, a model is suggested for selecting the most appropriate payment methods for a given e-government service. Finally, the application of the model is shown for the example of the statistics shop of the German federal statistical office.

2 Analyzing Payment Methods

Requirements for analyzing payment methods are divided into the following four categories: account-typical functional requirements, margin of amount and cost

structure, security requirements and requirements regarding the integration into the e-government process. In section 3, different payment methods will be assessed according to these categories and each of its criteria.

2.1 Account-Typical Functional Requirements

In this category, payment methods are rated according to whether they are suitable for the application in question regardless of cost and security requirements. Five criteria are considered in this category. The underlying questions for analysing the different payment methods are as follows (possible answers in parentheses):

- recurring payment: Does the payment method support recurring payments, like for season tickets so that customers need not repeat the whole payment process several times? (yes/no)
- internationality: Since there should be no obligation to personal registration in Germany, is it easy for the customer to register and use the payment method from abroad? (yes/no)
- anonymity: As far as possible, extensive data collection should be avoided. Can the customer use the payment process anonymously without the user's name being transmitted to the authority? (yes/no)
- spread: How widespread is the payment method based on the number of participants in Germany now and in the near future? (high/medium/low)
- payment guarantee: How certain can the authority be to receive payment guarantee? (high/medium/low).
 - "high": The authority receives an immediate payment guarantee.
 - "medium": The payment might be dishonoured for reasons the customer is not responsible for.
 - "low": The payment success is uncertain as long as the customer can deny having initiated the payment process.

Table 1 shows a selection of evaluated payment methods.

For example the "GeldKarte" allows no recurring payments because the customer has to repeat the payment process each time by inserting his card into a card reader. The use of the "GeldKarte" is only possible in Germany, so internationality is not given. The payment method is anonymous as no personal data is sent to the authority. Payment guarantee is high because the e-money is sent to the virtual purse of the authority in real time. To use the "GeldKarte" on the Internet, customers need a specific card reader. These hardware requirements are only fulfilled by a few customers, so its spread is low.

2.2 Margin of Amount and Cost Structure

In this category, the suitability of payment methods is assessed concerning the amounts to be paid in the scenario in question. The first criterion to be evaluated is the margin of amount. It might either be restricted by the system itself or by user

Table 1. Account-Typical Functional Requirements

payment method	criteria	recurring payment	Internationality	anonymity	payment guarantee	spread
GeldKarte		no	no	yes	high	low
Online Bank Transfer (Postbank)		no	no	no	medium	medium
Bank Transfer and receipt of payment before delivery		yes	yes	no	high	high
Bank Transfer and receipt of payment after delivery		yes	yes	no	low	high
Debit entry		yes	no	no	low	high
Credit card (SSL)		no	yes	yes	low	high
Credit card 3-D Secure		no	yes	yes	high	low
Paysafecard		no	yes	yes	high	low
Moneybookers (“Gateway”)		yes	yes	yes	high	low
Moxmo		no	no	yes	medium	low
C.O.D.		no	yes	no	high	high
Firstgate click&buy		no	yes	yes	medium	medium

Table 2. Margin of Amount and Cost Structure (in Euro)

payment method	criteria	0.05 Euro	0.50 Euro	5 Euro	50 Euro	500 Euro	5,000 Euro	50,000 Euro	Fixed costs once/annual
GeldKarte		0.01	0.01	0.015	0.15				0/0
Online Bank Transfer (Postbank)		0.001	0.01	0.10	1.00	10.00	100	1,000	0/0
Bank Transfer and receipt of payment before delivery		item fee	item fee	item fee	item fee	item fee	item fee	item fee	0/0
Bank Transfer and receipt of payment after delivery		item fee	item fee	item fee	item fee	item fee	item fee	item fee	0/0
Debit entry		item fee	item fee	item fee	item fee	item fee	item fee	item fee	0/0
Credit card (SSL)		0.5	0.52	0.65	2.00	15.50	150.5	1,500.5	0/0
Credit card 3-D Secure		0.5	0.52	0.65	2.00	15.50	150.5	1,500.5	0/0
Paysafecard		0.01	0.11	1.10	6.96				0/0
Moneybookers (“Gateway”)		0.00	0.00	0.00	0.00	0.00			0/0
Moxmo		0.25	0.26	0.30					500/100
C.O.D.		4.00	4.00	4.00	4.00	4.00	4.00		0/0
Firstgate click&buy		0.015	0.145	1.45					49/60

characteristics such as amount restriction from 0.01 to 200 Euro¹ with the „GeldKarte“ or account balance as the upper limit with bank transfers. Secondly, the variable costs for the authority and the customers have to be measured. Costs can depend on the number of transactions or the amount of payments made. For

¹ More information on the functions of the GeldKarte can be found at www.geldkarte.de.

transactions with the „GeldKarte“, for example, the tenderer has to pay 0.3 percent of the transaction volume, but at least 0.01 Euro. The variable costs are identified for different amounts payable as shown in the following table. Fixed costs are listed in the last column of Tab. 3, but only for the authority. They are separated into fixed costs to be paid once and annually payable fixed costs.

2.3 Security Requirements

As for this category, organisational and legal aspects have to be considered which protect customers from damages caused by lack of security [3] [6]. The following four criteria help to estimate whether customers have to fear manipulation or misuse of their Internet payments and whether personal data is protected: transaction control, intensity of the authentication process, possibility of objection or blocking and amount of liability. As before, the underlying questions for analysing the different payment methods are listed with possible answers in parentheses.

- transaction control: How accurate is the transaction control? Is there an easy and immediate control whether the transaction was successfully performed? Can the user check if unauthorised transactions were conducted? (high/medium/low)
 - “high”: The customer receives an immediate confirmation of the transaction as well as a record of the payments made.
 - “medium”: The customer either receives an immediate confirmation of the transaction or a record of the payments made.
 - “low”: The customer receives neither an immediate confirmation of the transaction nor a record of the payments made.
- level of authentication: How easy is it for a third party to make unauthorised payments to the disadvantage of the customer? Basically there are three possibilities of authentication: through possession (e.g. credit card), through knowledge (e.g. PIN) and through personal characteristics as with biometric authentication mechanisms. The latter will not be considered at this point as biometric authentication mechanisms are not yet common enough. (high/medium/low)
 - “high”: Two-factor-authentication – the authentication mechanism is based on both possession and knowledge.
 - “medium”: One-factor-authentication – the authentication mechanism is based on either possession or knowledge.
 - “low”: The authentication mechanism is based on a knowledge criteria which is not cryptic enough (e.g. account number and bank identification code for debit entries or credit card numbers).
- possibility of objection or blocking: Is it possible to inhibit the future usage of the payment method without significant delay? (yes/no)
- amount of liability: What is the maximum amount the customer has to bear in case of unauthorised payments by a third party – before the customer possibly can block the payment method?

Tab. 3 shows the evaluated payment methods concerning the security requirements.

Table 3. Security Requirements

payment method	criteria	transaction control	authentication process	possibility of blocking	liability amount
GeldKarte		high	medium	no	charged amount (max. 200 Euro)
Online Bank Transfer (Postbank)		high	high	yes	amount at disposal
Bank Transfer and receipt of payment before delivery		medium	medium	yes	amount at disposal
Bank Transfer and receipt of payment after delivery		medium	medium	yes	amount at disposal
Debit entry		medium	low	yes	0 Euro
Credit card (SSL)		medium	low	yes	50 Euro
Credit card 3-D Secure		medium	medium	yes	50 Euro
Paysafecard		high	high	no	charged amount (max. 100 Euro)
Moneybookers (“Gateway”)		high	medium	yes	money on account
Moxmo		high	high	yes	50 Euro
C.O.D.		medium	medium	no	0 Euro
Firstgate click&buy		high	medium	yes	no limit

2.4 Requirements Regarding the Integration into the E-Government Process

The fourth category of requirements to analyse payment methods refers to the requirements which mainly depend on the organisational and technical environment of the implementing authority [7]. No general statements can be made as the requirements arise with the process flow and the technical details of the implementation [1]. Costs differ by authority as they depend on the complexity of the integration process. Therefore three criteria have to be observed in more detail: the requirements induced by the process flow (e.g. “When does the payment process take place and how long dose it take until the payment is guaranteed?”), the requirements induced by the technical implementation (especially concerning confidentiality, integrity, authenticity and operational availability of the systems) and the fixed costs for the authority (license costs, costs for hardware and software, installation costs etc.).

3 The General Approach

It is difficult and sometimes impossible to find one single payment method which fulfils all requirements of the particular e-government application in question. Several requirements may have to be abandoned or a combination of different payment methods might lead to a better solution. The selection process has to consider and reconsider payment methods which might be suitable in combination with other payment methods without eliminating them at too early stage. Therefore partial

scenarios should be built. For example, when there is a payment method which allows no recurring payments and is available for foreign people, an undifferentiated selection process will reject it if the requirements are recurring payments and available for foreign people. But the method might be useful for foreign customers who do not use the e-government service regularly. Building partial scenarios will allow the model to select the payment methods which, in combination with other methods, fulfil the requirements of the whole service. In addition to building partial scenarios, the model has to take into consideration the relationships between different criteria. For Example payment guarantee has to be high if the customer is anonymous or if he is a foreigner.

Therefore, the process chain of the model consists of ten steps with several loops and bifurcations. The ten steps are:

- Step 1: building partial scenarios if necessary.
- Step 2: identification of the partial scenarios
- Step 3: weighting of the different partial scenarios.
- Step 4: identification of payment guarantee and spread requirements for each partial scenario.
- Step 5: selection of payment methods for each partial scenario according to functional requirements.
- Step 6: evaluation of the payment methods relative to payment amount and variable costs.
- Step 7: reconsidering a possible combination of methods.
- Step 8: checking security matters of the payment methods.
- Step 9: overhauling the expenses accruing integrating the payment method in the e-government process.
- Step 10: making the decision which payment methods are suitable for the whole scenario.

The idea behind the ten steps is to start with decisions easy to make which allow for a clear and well-defined subdivision of the overall problem and then, step by step, to solve problems more complex and time-consuming in the decision making process. Therefore, the building of partial scenarios helps to reduce the complexity of the decision, focusing on problems with fixed parameters (recurring payments, internationality and anonymity). The subsequent steps depend on more flexible parameters, in which the e-government manager has to decide on a suitable payment method by setting the level of parameters for his specific service (e.g. a foreign user should be able to use the service, so internationality must be “yes”). At this juncture, the decision maker also has to consider the relationships between the different parameters shown above.

Figure 1 shows the general process chain of the model for the selection of suitable payment methods for e-government applications. It consists of the ten steps shown above. The approach to the selection process will be demonstrated on the case study [21] of the statistics shop of the German Federal statistical office.

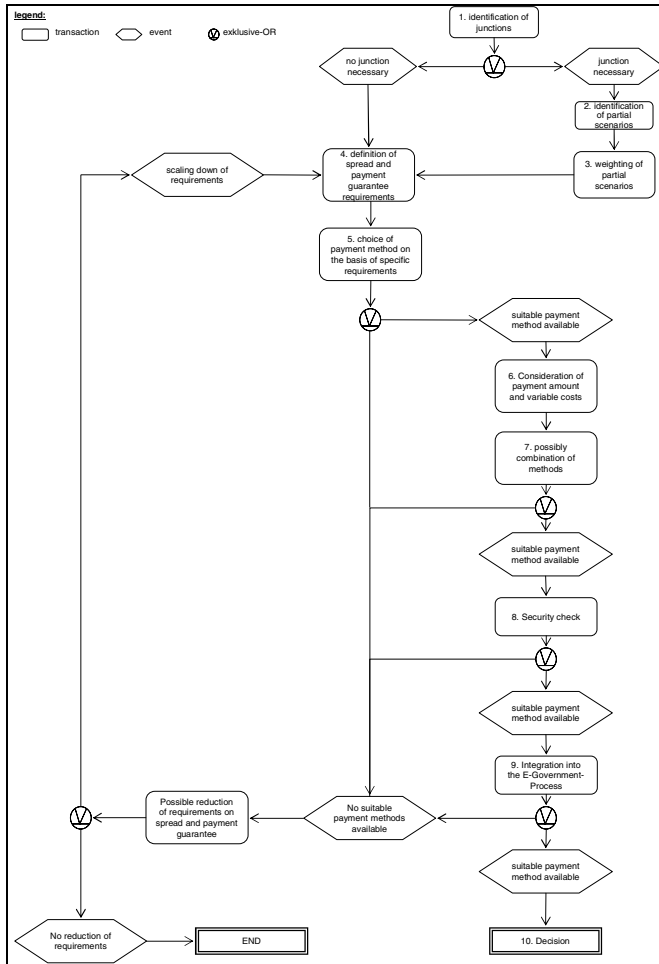


Fig. 1. General Process Chain

4 Applying the Model to the Online Statistics Shop of the German Federal Statistical Office

4.1 The Statistics Shop of the German Federal Statistical Office

In the statistics shop of the German federal statistical office (<http://www-ec.destatis.de>), it is possible to buy publications as well as national and international statistics from the Federal Statistical Office either as print version via postal mail or electronically via the Internet. This paper is focussing on the electronic delivery of the statistical data available. After registering once, private as well as corporate users are able to use the statistics shop in Germany and abroad. Required data for the registration process are: first and last name, postal address, state and e-mail-address.

Phone and fax number are optional. The users have access to the online shop through a user name and a 6-digit password. After selecting the requested data and putting them into the virtual shopping cart the user has to complete the order and simultaneously to select a payment process. Presently, payments through credit card or on account are possible. Only then the user can download the ordered data.

Amounts to be paid are micro- or macro-payments, e.g. 4 Euros have to be paid for quarterly cash results of the public budget and parts of the national accounting report cost 13.50 Euro. Frequency of use will be irregular for most users. Individual modalities can be agreed upon for mass users.

4.2 Application of the Model

As the first step, one has to analyse whether a division of the scenario in question into elementary partial scenarios is useful. A partial scenario has unambiguous requirements in terms of recurring payments, internationality and anonymity. An online shop allowing for one-time and recurring payments will be split up into two partial scenarios. After analysing the requirements and selecting the most suitable payment method for each partial scenario, the results will be consolidated in an aggregated solution for the whole e-government application in question.

Step 1: Is it reasonable to split up into partial scenarios? The following three questions have to be answered with “yes” or “no” to find the maximum number of partial scenarios.

- *Does the payment method have to support one-time as well as recurring payments?*
Yes. Subscribers regularly can receive monthly reports via email. However, most of the transactions will require one-time payments.
- *Does the application require anonymous payment in addition to personal payment?*
Yes. At least with non-recurring payments, users should have the possibility to make anonymous payments. The main reason is the German Data Protection Act².
- *Should payment be possible from abroad as well?*
Yes. Foreign companies deciding whether or not to invest in Germany should be able to get electronic statistics data and therefore should be able to pay from abroad.

Step 2: In case the answer to any of the questions from step 1 is “yes”, the compulsory partial scenarios will be identified on the basis of the following chart (Fig. 2). One partial scenario for example could be a recurring non-anonymous payment by foreign users.

After answering each question of step 1 with “yes” eight partial scenarios can be identified for the Statistics Shop Scenario.

² The underlying Laws are the Teledienststedatenschutzgesetz (TDDSG) and the Medien- dienstestaatsvertrag (MDStV) which demand only to take personal data if necessary.

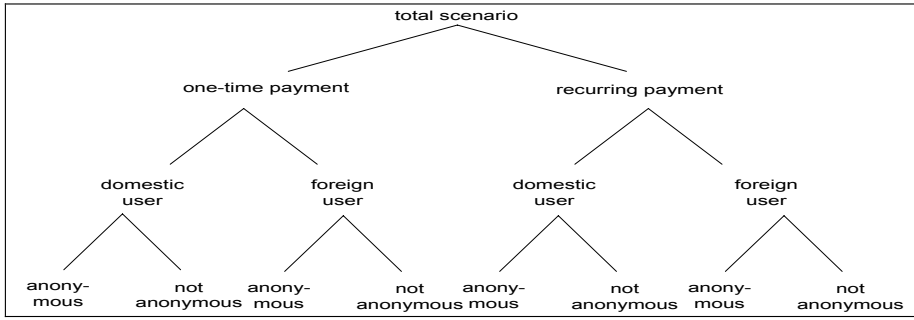


Fig. 2. Overview of the Compulsory Partial Scenarios

Step 3: Weighting of the different partial scenarios of step 2, as their importance for the e-government application in question might differ. Due to this weighting, it will be possible in a subsequent step to focus on highly important scenarios and to disregard less important ones.

For the Statistics Shop, e.g. recurring payments and foreign access to online statistics is assumed to be of minor relevance. Therefore, only 10% of the payment transactions are estimated to be periodically recurring payments and 20% of the transactions are made from abroad. Anonymous and non-anonymous payments are equally important for one-time transactions whereas anonymous payment methods are not needed for recurring payments.

The multiplication of the weighting of each branch leads to the relative importance of the partial scenario.

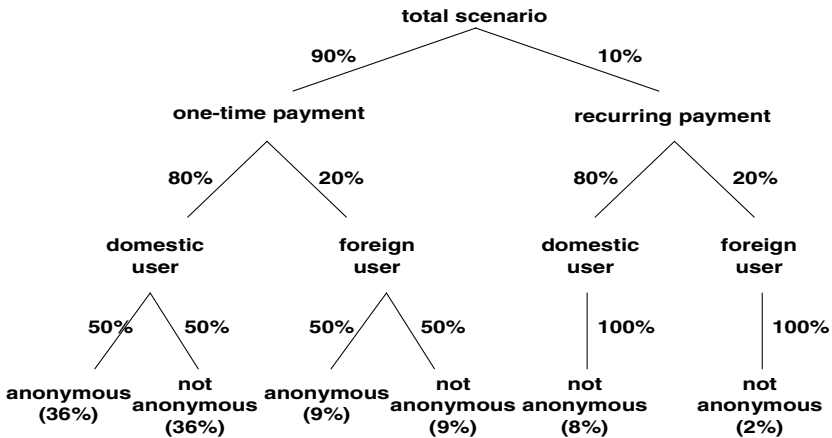


Fig. 3. Weighting of the Compulsory Partial Scenarios

Step 4: Identification of payment guarantee and spread requirements for each partial scenario. Examples: In the case of anonymity, the payment guarantee requirements

will be high. The spread of the payment method in Germany will be less important in case of foreign users.

The importance of the payment guarantee for the partial scenario (recurring payments, domestic, not anonymous) will be classified “medium”. Defaulting customers can be excluded from further usage of the online shop. The payment guarantee for the other partial scenarios should be rated “high”. The spread of the payment methods in Germany is not important for foreign usage. In case of recurring payments, domestic users will accept to invest in initialisation whereby “medium” spread of the payment method will be sufficient. One-time payments on the other hand, will require “high” spread of the payment method. Tab. 4 shows the properties for the selected payment methods.

Step 5: Selection of payment methods for each partial scenario according to table 1. In case no payment method meets the specific requirements, they should be reduced as far as possible and the selection process should be repeated for the partial scenario in question.

The payment methods considered in this paper do not allow for recurring payments by anonymous users. For the partial scenario (one-time payment, domestic, anonymous) there is no payment method with “high” payment guarantee and “high” or at least “medium” spread. Only by accepting “low” spread of the payment method in combination with “high” payment guarantee, four different payment methods are available: paysafecard, GeldKarte, 3-D Secure and moneybookers. The results of step 5 are shown in the following table (Tab. 4).

Step 6: In the next, step the responsible task manager has to analyse whether the selected payment methods are suited for the amounts payable. Variable costs should be as low as possible and neither system nor user characteristics must restrict the margin of the amounts payable. In the following chart (Fig. 4) the variable costs of

Table 4. Selection of Payment Methods for the Scenario of the Statistics Shop

partial scenario	relative importance	spread	payment guarantee	payment method
one-time payment, domestic, anonymous	36%	low	high	GeldKarte, paysafecard, 3-D Secure, moneybookers
one-time payment, domestic, not anonymous	36%	high	high	Bank Transfer before delivery, C.O.D.
one-time payment, abroad, anonymous	9%	not relevant	high	Paysafecard, 3-D Secure, moneybookers
one-time payment, abroad, not anonymous	9%	not relevant	high	Bank Transfer before delivery, 3-D Secure, C.O.D., paysafecard, moneybookers
recurring payment, domestic, not anonymous	4%	medium	medium	Bank Transfer before delivery
recurring payment, domestic, anonymous	4%	medium	medium	--
recurring payment, foreign, not anonymous	1%	not relevant	high	Bank Transfer before delivery, moneybookers
recurring payment, foreign, anonymous	1%	not relevant	high	--

each payment method in different margins of amount for the German Authority and the customers are summarised. The variable costs have to be adjusted in case of additional internal costs for the payment process.

For the online access to statistics, amounts between 0.01 and 50.00 Euro are relevant. Each preselected payment method from step 5 covers this margin of amount. The following chart shows the variable costs per transaction from the authority's perspective. The customers' costs are not indicated. With moneybookers users have to pay 1% of the amount.

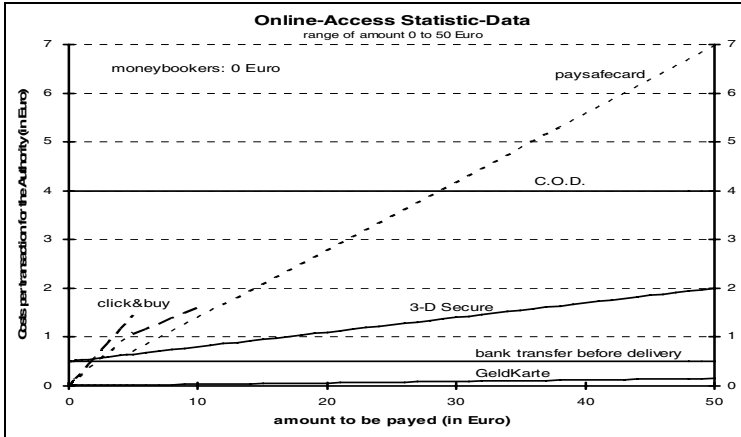


Fig. 4. Costs of the Payment Methods

Step 7: In case of one payment method not covering the whole margin of amount, several payment methods have to be combined. If no combination of payment methods covers the whole margin of amount the payment guarantee and spread requirements should be reduced as far as possible and the selection process should be repeated for the partial scenario in question.

In this case a combination of payment methods is advisable. The costs for C.O.D. are unreasonably high for small amounts. Payment via C.O.D. should be allowed only for a minimum order value. On the other hand, payment via paysafecard is disproportionately high for higher amounts, so it might be reasonable to set a maximum amount for using the paysafecard.

Step 8: In another step the selected payment methods have to be checked concerning the security requirements. Users should be protected sufficiently against misuse. Especially new payment methods have to be critically observed.

With the „GeldKarte“ and the paysafecard, users face the risk of losing their card including its remaining value. The other payment methods considered do not have unusual or serious risks.

Step 9: Furthermore, the preselected payment methods must fit into the e-government application in question. Time of payment, occurrence of payment guarantee, process delays and process cuts are crucial factors to be considered. In addition, the technical

implementation has to be coordinated with the payment service provider and fixed costs have to be taken into account. If necessary, payment guarantee and spread requirements may be readjusted at this point.

The payment guarantee should set in before delivery. The online access on statistical data should offer an integrated order and payment process. Bank transfer before delivery and C.O.D. do not offer a continuous integration. The other payment methods are assumed to fulfil the requirements of the technical implementation. As there is no precise information about the estimated fixed costs of integrating the selected payment methods, the fixed costs will not be taken into consideration for the following decision.

Step 10: Finally, the suitable payment methods of the different partial scenarios have to be put together to come up for an overall solution.

For this scenario, an anonymous payment method is preferable. Therefore, methods with the possibility of anonymous payments will be looked at first. Assuming that the payment guarantee requirements should not be reduced to “medium” and that payment should be possible from abroad as well, three payment methods can be distinguished: paysafecard, 3-D Secure and moneybookers. The disadvantage of these methods is the low spread. Complementary, a more widespread payment method like the bank transfer before delivery should be offered, even though it does not offer anonymous payment and the process will be disrupted. Additionally, recurring payments would be feasible with the bank transfer before delivery.

The combination of paysafecard and 3-D Secure is advantageous as both methods allow for anonymity and the proportionally high costs with the paysafecard for higher amounts and with the 3-D Secure method for amounts below 2.60 Euro can be reduced by appropriate maximum and minimum amounts. With moneybookers, there are no variable costs incurring for the authority. But it is problematic whether customers will accept the variable costs of 1% of the amount payable. Conceivably, the authority might accept the costs if organisationally possible. A final decision between 3-D Secure and moneybookers cannot be taken at this stage.

5 Conclusion

The selection of the most suitable payment methods for e-government applications shows that currently for the German market there is no single best payment method which takes into account all the criteria of the scenario in question. In general, the tendering authority favours widespread payment methods simultaneously allowing for a high payment guarantee. Today, both features are provided only by the bank transfer, by C.O.D. and the receipt of payment before delivery. But there are severe disadvantages of these payment methods. The costs of C.O.D. payments are relatively high for the authority and the customer cannot always personally receive the delivery. Furthermore, C.O.D. primarily comprises physical goods. It would be possible to send access codes for digital products or services by mail, but the services could be accessed only after receiving those codes. This conflicts the aim of making e-government processes straight-through as far as possible keeping the access to e-government services simple and comfortable. The same disadvantage goes for the

bank transfer before delivery. The authority has to wait for the credit note before receiving payment guarantee.

To support straight-through processing of the e-government application, less common payment methods or payment methods without immediate payment guarantee have to be taken into account as well. By reducing the requirements on spread for example, e-mail based or charge card based methods like “GeldKarte” or “3-D Secure” allow for straight-through payment processes with immediate payment guarantee for the authority.

To summarise the findings of this paper as well as of related research on a more general level, the research shows three main criteria for payment methods in e-government: payment guarantee, wide spread and support of straight-through processing. None of the existing payment methods fulfils all these requirements simultaneously. But if payment methods like debit entry or credit card payments were reconfigured using digital signatures which allow full electronic and at the same time legally binding contract conclusions, e-government might break through. In Europe, such attempts are on their way. Many European countries have executed the directive of the European Parliament and the Council on a Community framework for electronic signatures [8]. The core of the directive states that the electronic signature is legally equal to the signature by hand, if it is created using a secure signature creation device (chip card).

In Austria, for example, Banks are issuing digital signature chip cards enabling the use of e-government services and offer such services in their online portals. In Germany, the Banking industry is planning to issue signature cards combined with a payment method. The primary problem to use the main benefits of the electronic signatures (the possibility of full electronic, legally binding processes) is to make electronic signatures useable for the mass of the people.

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A Case Study of Semantic Solutions for Citizen-Centered Web Portals in eGovernment: The Tecut Portal

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Abstract. Web portals are emerging as significant tools for eGovernment. Portals are the “gateways” between citizens and Public Administrations. Although a number of them have been already developed, shortcomings related to interoperability and usability limit their usage and potential. To improve their performance, we propose a semantic approach based on the so-called “Life Events”. This approach provides several advantages related to service automation and enhanced searching. Also, the usability offered to the end users is improved. To validate our techniques, the proposed approach has been applied to a real case study: the Tecut Portal.

1 Introduction

Web portals are playing an important role in the provision of digital services for citizens and Public Administrations, here after PAs. The evolution from the old-fashion Web sites to the current Web portals has allowed the development of new ways of doing business, learning, accessing services ... They are referenced, in the modern information society, as eTechnologies. At the same time, PAs noticed the emerging of Web portals as significant tools enabling eGovernment and they introduced them as gateways to interact with citizens. Of course, the introduction of Web portals allow the reduction of time and cost both for Public Administration and for citizens.

A number of eGovernment portals have been already developed even though, in several cases, shortcomings related to interoperability and usability limit their usage and potentiality. Due to the unavoidable need for service integration, interoperability concerns must be solved. This issue involves concerns at administrative, operational, technical, semantical, legal and cultural level [1]. Thus, PAs must perform a long-term study to evaluate how to deploy their solutions. These ones must provide the highest possible level of satisfaction to really increase the level of interaction with citizens.

This paper intends to show the implementation of a solution offering customer-oriented services and the integration of the former in a Web portal. A semantic-based approach on the so-called “Life Events” is followed to drive proposed features. Our proposal allows several advantages such as automatic services composition, advanced searching mechanisms, new functionalities as well as a better usability from the point of view. Summing up, our approach provides a more friendly users support for eGovernment services. To validate our techniques, a real case study has been developed: the Tecut Portal [2].

The rest of the paper is organized as follows. Firstly, we present the eGovernment state of the art. Secondly, we introduce the Tecut Portal, the study case we are dealing with. Next section introduces the concept of Life Event as it is going to be considered in the proposed framework. Later on, we introduce semantics in the system to model in a formal way the use of LE and to support its invocation. Finally, some future work and conclusions are yielded.

2 State of the Art

Web portals represent integrated gateways for government service between PA and users to provide a single point of contact for services. The goal of eGovernment services is to conduct complete end-to-end solutions for citizens whenever it is possible. As portals integrate services, they certainly improve access to government, reduce service-processing costs, and enable PAs to provide a higher quality of service.

The development of Web application for eGovernment services has benefits for both government and citizens. Allowing the access to information and services by means of Web interfaces, citizens and businesses can now access and interact with PAs under a 24/7 model.

We can also make a distinction related to the level of possible interaction in eGovernment solutions [3].

1. Emerging presence (stage I). Just information is presented and documents are available only for download.
2. Enhanced presence (stage II). Citizen can search for documents and perform more advanced operations; nevertheless, citizen can submit very little amount of information to PAs.
3. Interactive presence (stage III). Interactive services are available and government officials can be contacted by email, fax and telephone.
4. Transactional presence (stage IV). Two-way interaction is supported and complex services (such as taxes, fees and postal services) are available.
5. Networked presence (stage V). Final level that integrates all services under ICTs platforms and support a two-way open dialog between citizens and PAs.

The highest functioning Web portals show a complete system integration across agencies whereas portals with the lowest level of functionality provide little more than access to forms and static bits of information. High-functioning portals

create a true one-stop shop for citizens^[4]. In particular usability, customization, openness, and transparency represent the key aspects of portal functionalities^[5].

As matter of fact, Web portals from PAs can take advantage of semantic solutions to solve issues related to organizational heterogeneity, interoperability and information accumulation. Information and services can be provided by different governmental agencies in different locations and the user does not necessarily know the organizational structure and who is responsible for each service. In these contexts, semantic is expected to play a relevant role. In literature we can find some interesting initiatives, at different levels, that make use of semantic:

- e-GIF (eGovernmentInteroperability Framework) ^[6] is the technical guidance for deploying eGovernment in the United Kingdom. Among many other national initiatives, it is relevant for our case because of they support for semantic features as in e-GSM (eGovernmentMetadata Standard)^[1].
- Several projects supported by the EU through the Framework Program must be cited:
 - OntoGov^[7]. This project deals with the problem of services in eGovernment under a semantic point of view and it is aimed to provide an ontology to model the problem in a maintainable way.
 - Terregov^[8]. This project's main goal is to provide an interoperable layer that allows citizen to access eHealth services in a transparent manner by means of web services.
 - The SemanticGov project^[9]. This project aimed developing a software infrastructure to provide support for PAs by means of semantic. Currently, it is an ongoing project.
- Suomi.fi^[2]^[10]. The Finnish portal for eGovernment services that provides a taxonomy for the classification of services.
- EIP.AT^[3]^[11]. A project developed in the University of Linz, Austria, that addresses integration problems and tries to solve them by means of semantic modeling.

3 The Tecut Portal

Several Italian Regions were suggested to develop eGovernment solutions aimed at increasing interactions between Public Administrations and citizen by means of ICTs infrastructures. In order to accomplish this high level goal, several issues related to key aspects in the eGovernment domain have to be taken into account, such as authentication and authorization, service publishing and discovery as well as composition. As results of these considerations and according to a recent study about skills for the case^[12], it was developed the Tecut Portal^[2] (see Fig. ^[1]), a fully integrated government portal for shared and standardized services within the Marche Region.

¹ <http://www.govtalk.gov.uk/documents/eGovMetadataStandard%2020040429.pdf>

² <http://www.museosuomi.fi/suomifi>

³ <http://eip.at>



Fig. 1. Tecut Portal home page

This study case is aimed at supporting activities of small and medium enterprises. Besides, the adaptability due to changes on political, social and economic conditions is a leading feature in the system.

A global vision of the Marche Region comprising further financial arrangements and aggregations, enterprises, banks and citizens is provided. This clearly boosts the national and international chances to increase relations with PAs and drive advanced ways to improve standards of living. As a matter of fact, the Marche Region is among the first places in Italy as far as welfare, cohesion and competitiveness are concerning.

Even a lot of issues deserve a special attention, we would like to devote attention to a few of them. The authentication process plays a main role in Tecut. It represents the instant when the system determines the association between the digital identity and the user. The recent proliferation of digital services has raised concerns about a lot of authentication mechanisms. Marche Region supports the realization of a central authentication solution through Cohesion [13]. It is an infrastructure that provides solutions for complex technical problems and a set of common standard services predisposed to realize applicative cooperation as the national eGovernment plan states.

Authentication services for centralized management access in private areas are provided by Single Sign On (SSO) [14] and Profiling system.

- The SSO's tasks are predisposed for the transfer of credentials between authenticated users and access portal. In particular, the authentication on the

framework is possible with different levels: via weak registration using username and password and via strong registration using services regional cards “Raffaello” [15]. Furthermore, SSO allows a transparent access to the portal’s reserved areas without further authentications and it allows that authentication credentials and user profiling are made available to different application domains. Indeed, the user authentication check is delegated to the service. It uses a regional services register to validate the profile in respect to the access roles.

- The profiling system is dedicated to the coordinated management of credentials information, logically divided in a static subsystem and in a dynamic one, containing a series of attributes able to indicate the user’s preferences when accessing the services. A part of user base profile will be requested during the registration phase, and another part is communicated after explicit request, when a service is used.

Processes related to discovery and composition of services were designed by means of LifeEvents, as explained later on. This new approach brings several advantages in the design and planning of solutions as shown in next sections.

Therefore, the portal is expected to offer a holistic support for on-line operations regarding Public Administrations within the Marche Region. Provided interfaces and information are expected to make easier citizen’s life. At the same time the portal has become a reference point at organizational level providing back office governance. Currently, the portal is a gateway for 531 agencies, provides 65 different kinds of services and 34.515 digital services.

4 LifeEvents as Organizer

The provision of advanced services and the so tight constrains related to interoperability lead us to the search of a common paradigm to build up facilities in an interoperable and effortless manner. From the study of the domain and the requirements of the former, an approach based on Life Events is proposed. Within the context of this proposal, Life Events (here after LEs) are those situations that drive the citizen to interact with the administration in order to fulfill an obligation or execute a right. Thus, we can consider as “Life Events” situations such as getting certifications, paying a fine, getting married, moving, . . .

The first time the concept of LE about eGovernment was used is related to the eGovernment project [16]. In that context, Life Events were defined as “situations of human beings that trigger public services”. That definition is the starting point for our semantic definition of LE. This idea is reused in different official pages such as the Ontario’s Official Site⁴, Nova Scotia’s one⁵, the Irish eGovernment initiative⁶ and others. Those pages make use of the concept of LE to index and locate services according the citizen requests.

⁴ <http://www.gov.on.ca/>

⁵ <http://www.gov.ns.ca/snsmr/lifeevents/e/>

⁶ http://www.oasis.gov.ie/siteindex/by_life_event.html

We make a step forward towards the definition of LE. By mean of semantic definitions and properties, an entire system is proposed to catalogue, search, discover, and orchestrate services in the domain. In the definition of LEs, documents play a relevant role. In any democratic administration, documents are the only prove that an operation has to been done and must be supported.

Taking into account the former considerations, we establish a semantic based definition for LE. These elements are going to play a main role in our case and they are expressed using semantic terms shared by the whole system. The definition of a LE includes the following items.

- **Task.** Title for the considered operation. Folksonomies can play an interesting role as they provide support for semi-automatic enhancements of discovering services.
- **Description.** High level description of the desired operation expressed in natural terms from the point of view of the citizen.
- **Input Documents.** As previously stated, all operations carried out by the administration require some input document. Citizen is requested to provide a signed form in order to invoke the operation. This element plays a role similar to *preconditions* in some environments. In the considered case, we can identify as inputs documents, the current certification
- **Output Document.** Of course, as a result of any performed operation, the PA in charge must provide an output expressed in terms of the ontology. This information will be put together into one or several documents. This output will vary its content from the expected document (i.e., a certification, a license, . . .) to information about the failure to get the expected document.
- **Scope.** We must identify the scope of the operation (local, national, international, . . .) where we want the operation to be recognized.
- **Security Conditions.** This is intended to express the conditions for the security mechanism involved during the whole process. This includes the identification of both parties, citizen and PAs, and also the way is stored by any agent involved that could be able to use it.
- **Cost.** This will express the amount you have to pay for the requested operation and/or also the time it will take for the completion of the operation.
- **Version.** Life Events can be modified and changes from one version to another one must be tracked.

These elements will be defined using the power of semantic expressions that will allow us to provide advanced services for discovering and orchestrating them. LifeEvents can also be tagged using well-know metadata standard already proposed and endorsed by relevant organizations such as [17], [18] and [19] from the CEN.

So, we propose the transformation of final services as they are requested into new LEs expressed in terms of the semantic definition using the former items presented. Thus, the goals presented in the previous section about Tecut can be achieved. This schema is suitable for eGovernment field, or at least more suitable than in other environments, due to several reasons: all operations require some

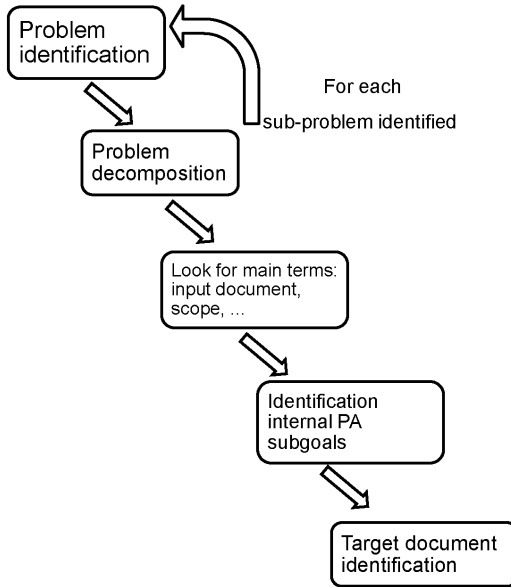


Fig. 2. Schema for the definition of LE

input document, the most common output in the service is a new document, there is no need (opportunity) for bargaining about services, there are limits and conditions very explicit about the data managing in terms of trustability and security (non-repudiation, privacy, integrity and confidentiality) and operations does not have real time constrains.

In order to transform common services into LE, expressed in the proposed terms, we must follow a simple methodology. For the sake of clarity, we are going to show the former by means of an example: the situation in which a citizen has to move to a new residence. This operation may require the collaboration of several different PAs and several processes the citizen does not have to be aware of. Thus, we propose the following schema (see Fig. 2).

1. Identify the problem and dealing features as PAs involved.

Applied to our practical case, the task we are dealing with is the change of address for a citizen. The involved PAs are the cities council, of course, they should involve several offices or divisions but that should be transparent for the citizen.

2. Decompose the problem into different problems that may be solved in a single step, i.e., each step must produce as output a document meaningful for the citizen.

The considered operation in the example may involve one single operation and no subprocesses are relevant to the citizen.

3. For each identified subprocess, look for the input documents, scope and cost. These ones must be expressed in terms of the LE ontology.

The input document required in our case is the certification of the current citizen address, the document to prove the new address and the signed request for the change. The scope for the operation is national. No cost is put on the citizen and no limitations are related to it.

4. Identify internal partial aims for citizens and PAs. These steps usually involve internal documents. They can be meaningless for the citizen but relevant for the administration.

In our example, several steps can be identified: check for the correctness about the former address data, look for pending payments, update internal data, notify related PAs, and, finally, generate the certification for the new address.

5. Identify possible documents as possible final steps of the operation.

In our case, the target document is the certification for the new address. Nevertheless, if problems arise, mainly related to some internal step, documents to notify those errors may be generated. Those documents will inform about problems due to pending payments, problems with legal constraints, ... These documents must be included in the ontology.

6. Update all services and agents that may be aware of the new service.

Once all this information has been gathered and codified properly, it can be presented to the end user.

As a result we can identify in Tecut a classification of LE that enhances the accessibility from the point of view of the citizens. Navigating from the home page of the Portal, users can easily access a list of LE classified according to a taxonomy to choose the one best fits in their interests.

5 Semantic Life Events

Semantic plays a relevant role in this solution. By means of ontologies [20] we are addressing a higher level of abstraction than the one based on raw data. To undertake the provision of an ontology we may use different languages [21]. OWL (Ontology Web Language) [22] a W3C Recommendation is the chosen one for our proposal. By using OWL, we are addressing a standard, solid and interoperable platform for the provision of this solution. Proposed approach takes advantage of the power of OWL to express the information relevant for the system. Nevertheless, we must keep in mind that OWL is just a tool to express knowledge with all its potential and limitations. Thus, following Methontology [23], a FIPA recommended process to develop ontologies, one has been developed.

In this ontology, we have reused former already defined data representation. For example, for the definition of the citizen, one main class in the system, FOAF [24] has been reused, and, to mark documents in the system, metadata in [18] has been taken into consideration. This is part of a general philosophy leading toward the maximum possible agreement and reusability both of ontologies and software derived from the former.

On the other hand some limitations on the possibilities of OWL to express knowledge have been faced. In particular, OWL does not support relations that

involve properties whose range is a class itself, just an individual from a particular class. This leads us into shortcomings in the definition of some relations (for example, we would like to establish a relation between an individual from the class LE and a subclass of “document”, not an individual from that class). This situation was overcome using a higher level of abstraction implicit in a single individual (the use of individual document belonging to the class document as a generic one with no information by itself).

Additionally and for the sake of consistency of current and future information in the system, some rules have been defined (see Fig 3): all LEs generate some Document (Rule 1), all LEs are supported by some PA (Rule 2), all Documents are issued by some PA, . . . Of course, lower level details about the conformance to local or national laws regarding document and legal procedures are not considered at this point and further implementations of the system should take care of it.

Rule	Definition
Rule 1 $R_1 = \{\forall LE \exists Doc,$ $generates(LE) = Doc\}$	<pre> <owl:Class rdf:about="#LifeEvent"> <rdfs:subClassOf> <owl:Restriction> <owl:onProperty> <owl:FunctionalProperty rdf:ID="generates"/> </owl:onProperty> <owl:someValuesFrom> <owl:Class rdf:about="#Document"/> </owl:someValuesFrom> </owl:Restriction> </pre>
Rule 2 $R_2 = \{\forall LE \exists PA,$ $isSupportedBy(LE) = PA\}$	<pre> <owl:Class rdf:about="#LifeEvent"> <rdfs:subClassOf> <owl:Restriction> <owl:someValuesFrom rdf:resource="#PA"/> <owl:onProperty> <owl:InverseFunctionalProperty rdf:ID="isSupportedBy"/> </owl:onProperty> </owl:Restriction> </rdfs:subClassOf> </pre>

Fig. 3. Rules defined in the system

Once the ontology that describes the system is provided, the development of support for the access to these LEs must be faced. As the only possible interface is the Web page, all the logic and semantic processing is put on the Web Server.

Nevertheless, the chosen approach is based on wrapping LEs with Semantic Web Services to define and to support them. The reasons for this decision are due to the wishes to provide a standardization of these definitions and the use of already developed software packages to deal with the information. The current state of art regarding this topic in the present moment it is quite unstable. Thus, we can find technologies designed to introduce semantic in Web Services that are emerging and others that may be in process of obsolescence. To meet our requirements, we decided to make use of WSDL-S [25]. Main reasons to choose this option among other available possibilities are due to its simplicity but semantic power to express all required information. Other options were dismissed because of different reasons. OWL-S [26] was seriously considered but it introduced a lot of overhead and it did not provide any clear advantage on WSDL-S, a much lighter technology. WSMO [27] was also considered but the use of mediators does not really fit in the aim of this project.

Each LE drives the generation of a WSDL-S file describing it. *Inputs* and *outputs* in each *operation* included in the system, are defined in terms of the ontology developed. As the preconditions and effects are implicitly provided, respectively, by the inputs and the outputs, it is enough if the latter are stated. Thus, in our example, the LE “*moving*” is defined using a WSDL-S file. This one declares, as inputs, documents identified previously. Accordantly, the output of the operation is defined also in terms of the same ontology and, in this case, involves the already indicated documents. Thus, it is quite simple to make compositions using a semantic reasoner as it only will have to link outputs and inputs expressed in the same terms from the same ontology.

Anyhow, we must keep the perspective that WSDL-S is just another tool to introduce semantic on LE and many others can be used. As a matter of fact, if required, it is possible to extend the WSDL-S to other technologies with little effort. In fact, some transformations can be done easily [28].

As a result of these design decisions, advanced ways for the composition and the discovery of services are possible within the project Tecut.

6 Conclusions and Future Works

In general, eGovernment Web portals are evolving towards a semantic distributed and cooperative approach. In particular, the Marche Region presents a federate community where the discovery of services play a main role. This federated reality allows the sharing of digital services. The fair distribution of the latter saves time and costs. Regarding to the discovery processes, we propose a richer semantic description of services, this proposal considers also metadata to introduce a flexible and extensible LE representation.

Therefore, this paper presents an in deep review of how semantic can be applied to the provision services in the domain of eGovernment. Thus, using a Web portal to provide support for citizen needs, a LE-based approach has been provided.

Currently, two working lines within the frame of this project are under design. The first one is related to the enhancement of semi-automatic discovery

mechanisms. In this way, a wiki-like tool is planned to support the construction of a folksonomy to tag services with human friendly information. On the other hand, a digital repository of LEs defined by external PAs is to be designed. In order to obtain full potential from semantic Web Services, also it is planned to provide mechanism to allow that other PAs may upload their own definition of LEs. This would turn out Tecut into a common repository of services from a widespread group of PAs. All LEs in the pool would also be available for citizen through Tecut.

The transformation of common services into LE-based ones has been proofed to be a not too complex process that clearly increases the functionalities and capabilities of the entire system. To unleash all possible functionalities, from the presented work, semantics are called to play a main role in the process of describing and accessing information and services.

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Inclusion in the E-Service Society – Investigating Administrative Literacy Requirements for Using E-Services

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Abstract. This paper investigates potential changes in requirements for “administrative literacy” – knowledge and skills required from citizens – when manual services are replaced by electronic ones. Do requirements increase, decrease or change qualitatively? We compare manual and electronic versions of ten commonly used services. The needs for knowledge and skills, content and procedures were considerably less for the e-services in eight out of ten cases; however, in complicated services there may rather be a change of skills, e.g. replacing verbal skills with skill in searching for information online.

E-services relieve the user of some requirements; hence one obstacle for inclusion is reduced. However, we also found problems with the e-services implying that design of e-services should be informed by the kind of measure we have used as it is of great importance for inclusion in the e-society.

Keywords: electronic government, assessment, electronic services, e-participation, knowledge, skill, administrative literacy.

1 Introduction

Do electronic services make for a more inclusive society or a more segregated one? In the public debate both views have been argued, but mainly by speculation and anecdotes; there has not been much scientific investigation. The concept of “digital divide” appeared in conjunction with the rapid increase in Internet use in the late 1990s, and is typically defined in terms of physical access to computers. Over time the concept has been widened to include a number of issues, including the infrastructure needed to support the use of computers such as internet connections and electricity; physical barriers such as long distance to e.g. a library; economic barriers, such as being able to afford a computer; social and cultural barriers and patterns, including different social patterns in different social groups making for different uses of computers, e.g. for entertainment vs. for searching for information and taking part in politics; technical literacy, the ability to use a computer [1] [2] [3].

It is fair to say that most interest has been paid to the issues of access and computer literacy. For such issues there is national and global statistics and reports since around

the turn of the century, including the US Department of Commerce series “Falling Through the Net” [4] [5] and the ongoing work of World Internet Institute covering more than 20 countries and producing numerous reports and comparative studies [6].

Digital divide issues have not yet been clearly tied to the development of self-service in the public sector. Self-service is essential for electronic government, yet little attention has been paid to such services beyond the obvious economic and usability perspectives. In this paper we go deeper into the issues of taking part in society by investigating the nature of such services.

The issue of citizens’ handling administrative work in contacts with government has recently been acknowledged, however so far only fragmentary. The concept “administrative burden” is used to measure the time and costs incurred upon citizens by government services. In the specific context of electronic services, the concept is used as a design criterion, and as a way of putting pressure on e-service providers to reduce the trouble for citizens using services [7] [8]. Administrative burden measures the estimated time required to use a service and then calculates a cost by assigning a cost per time unit for citizen activity. While this is an improvement compared to the earlier ignorance of users, the measure does not take into account digital divide issues such as the varying ability of citizens to at all use the service. There have been attempts to move beyond access to computers and discuss peoples “online” skills in terms of the activities and social contexts they are involved with rather than the tools they use e.g. [9] [10] [11], but little empirical work has been done. Only a few reports e.g. [1] have discussed the issue of what we by analogy call “administrative literacy”, the ability to navigate bureaucracy, which includes having a good idea of how society’s institutions work, the terminology involved and hence being better able to know where to go to find the forms, procedures, contact information etc. necessary, and indeed understand the information once found and being able to act upon it.

This paper takes this discussion a step further by examining if and how electronic services are designed to meet the differences in administrative literacy that can be expected among citizens. Overcoming the digital divide in this respect means public sector services must be designed in a way that at least minimizes the problems associated with people’s different knowledge and skills. When services become electronic, do they require more or less skills and knowledge compared to manual services? Electronic services replace human intermediaries, the civil servants. In doing so, the knowledge and know-how these people possessed must either be made available electronically or be left to the citizens to learn, or some combination of that. This paper investigates the need for skills and knowledge in using electronic services from government – i.e. the requirements for administrative literacy– by means of comparison. We compare electronic and manual versions of services to see what skills and knowledge is necessary, both in terms of amounts and nature. The research question is “*How, if in any way, do the needs for skills and knowledge change when government services move from physical to electronic delivery?*”

There are three hypotheses associated with this research question:

1. The need for skills and knowledge *increases* when services become electronic, and hence more people will be *excluded*, unless some measures are taken to remedy.

2. The need for skills and knowledge *decreases* when services become electronic, and hence more people will be *included* as more people will be able to understand information, how to take action, etc.
3. The nature of the skills and knowledge necessary *changes* when services become electronic, and hence *different people* will be included or excluded. For example, young people with ICT communication skills might be more active in their relations with government – which they are traditionally not very knowledgeable about – whereas older people who are knowledgeable about government might decrease their activity as their lack of ICT communication skills prevent them from maintaining these activities.

There is some work investigating the issue of customers turning into self-servants, both in the public sector [13] [14] [15] and in the private [16] [17] [18]. While this work investigates the shift in roles, it takes a production focus rather than a societal one. It also studies the phenomenon at a rather general level, discussing rather the extent of the phenomenon than the details of it. There is hence a need to go more into detail in the investigation of skills and knowledge requirements. This paper does that, and it also puts the findings into a societal perspective of the relation between government and citizens.

This paper reports a walkthrough test of selected services, manual and electronic, to investigate the skills and knowledge associated with using both kinds of services. We hence test the preconditions (requirements for skills and knowledge), not the outcome. Actual outcome (exclusion or inclusion) may be affected by many other variables such as user education, practice and better designed services. This study contributes by clarifying a major precondition not earlier measured stringently, the requirements for administrative literacy that services impose upon users. This is a precondition that can be affected positively by better designed services, so this study also contributes by suggesting a way of improving the performance indicator administrative burden in terms of knowledge and skills rather than just time.

The paper is designed as follows: Section 2 describes and discusses the method for selection of services and data collection. Section 3 presents findings and Section 4 discusses implications for service design, what predictions we can make from this study and what further research has to be made.

2 Method

The term walkthrough refers to following paths through the processes a product or service is designed to support. Walkthrough methods are often used in the software industry for testing both algorithms, architectures and usability. The Cognitive Walkthrough method focuses on how easy it is for users to accomplish tasks with the system [19] [20]. A walkthrough is typically done by experts using established pertinent frameworks of reference, e.g. best practice, legal regulations, technical and business standards, scientific test results. In situations where best practice is unclear or the system is novel and not clearly understood, the walkthrough can be complemented by conducting tests with users from the target population. In this case, practices are quite clear. Electronic services have been around for more than a decade, there is a vast literature on usability and usefulness testing, and there are standards and best practices. Further, the practices under study – public services – are well known, established and used for many years. They are also well documented as they

draw on regulatory systems, laws and bylaws. Hence, the fields are well known and an expert walkthrough is appropriate.

Service selection. Walkthroughs are scenario based. Scenarios can be designed to be common or special. In the former case typical use is investigated, in the latter critical conditions are sought, such as behavior in emergencies. To build scenarios we selected a number of typical government services starting from the categorization made by sverige.se the national Government site providing an index to the whole government sector organized by ten “life situations”:

1. To work and make a living
2. Education throughout life
3. To move and to live at a new home
4. Immigration to Sweden
5. To travel
6. To influence politics
7. To plan retirement
8. To start a family and have children
9. To seek treatment because of illness
10. To buy merchandise and services

Under each of these headings are listed numerous clusters of services pertaining to each situation. At a third level the clusters are opened up and actual services are found. From these services we made a selection based on the following criteria, to be met not necessarily by each service but by the whole set.

1. Some services should be commonly used, i.e. by many people.
2. Some services should be frequently used, so there can be a learning effect for the individual.
3. Some services should be rarely used, so they have to be easy to use by first time users to at all be used.
4. At least some services should be important to taking part in society, such as taking part in politics.
5. The whole set of services should cover the whole field; hence we selected one service from each of the ten fields listed above.

For each selected service we designed a scenario relevant for a typical user (all presented in the Findings section).

Data collection. Two people went through the process of using that service. One used the manual service, the other the electronic one. Each person independently wrote a report describing the events encountered during the walkthrough and noted skills and knowledge necessary for pursuing the process. Knowledge requirements can be of different nature. For example, if at some point there was a need to know a particular URL that is a key point. In that situation there is a need to take some other action – outside of the service process as designed – to find it. In other cases there may be a need to know which agency is handling which issue so as to know where to call. In yet other cases the user may have to be familiar with the processes and regulations at more than one agency to understand the terminology used, for example starting a European organization may require understanding what the difference between a European Cooperative and a European Economic Interest Group is from a taxation perspective. This understanding

needs to be achieved before registering although it is not part of the actual registration. Registration is done at the Swedish Company Registration Office, not the National Tax Board, and the former does not deal with taxation issues (and does not link its information to the Tax Board, neither on the web nor in the manual service). Wherever such points were found, the required knowledge or skill was noted. Additional actions necessary were also listed and investigated if possible.

The reports were ordered by the user-perspective problem-solving process of Grönlund (2001) [21], which contains the following four phases.

1. **Orientation.** Where should I turn? Which organization(s) provide information or services pertaining to my problem?
2. **Investigation.** There may be several ways to solve the problem. Different organizations may provide solutions differing in quality, price, accessibility, terms of delivery, or other. The different opportunities must be found, as well as sufficient data to make comparisons.
3. **Choice.** Choosing among alternatives may involve many parameters: quality, price accessibility etc. There may be a need for tools such as a calculator, or the choice may be made on issues of user preferences, e.g. preferring a train over a bus for environmental care concern.
4. **Implementation.** Once a choice is made, users want to implement their decisions by ordering a product or a service and by specifying parameters such as delivery terms and specific product features (color, size, amount, etc).

This way each scenario produced two lists of actions that could be compared both in terms of amount and nature of the work done. Amount includes the number of things a user has to do and the time required to do it. Nature includes the specific pieces of knowledge and skills, background perspectives necessary to interpret specific information, etc. that are needed to pursue the process. This comparison was first done by the first author, then the result was discussed with the testers for clarifications and interpretations.

3 Findings

The hypotheses we investigated concern whether the need for skills and knowledge increases, decreases or changes qualitatively when services become electronic. The distinction between manual services and electronic ones were made such that electronic were those that could be used on the web. Manual ones were those which were done by telephone and/or personal visit. The manual ones typically include an automated voice response system, but as this is clearly an extension of the manual system we included that as a part of the manual process. Below we list the main differences between electronic and manual services in the ten cases. For each service we note issue at each step (Orientation, Investigation, Choice and Implementation) where differences were found.

Case 1. Service area: To work and make a living. Scenario: You are unemployed and want to find a new job to apply for.

Electronic service	Manual service
<p>Orientation: The Job Office was found as first link on first search, but there is no single entry point to all information sources.</p>	<p>Orientation: Requires knowing which organization(s) handle(s) these issues; finding addresses and telephone numbers</p> <p>Investigation: Requires knowing about all information sources and/or skill in finding out. Requires communication and social skills for e.g. asking around at companies. At the Government Job Office computer skills are necessary as search is online only.</p> <p>Choice: Requires cognitive skills to keep all information in mind, or extensive work with writing it down, collecting ads etc.</p> <p>Implementation: Some companies require electronic application.</p>

We found over 130 web information sources to available jobs in the City of Örebro alone. The government Job Office is well known and hence easy to find also in the manual service, but there are many other agencies. Some of the other agencies are only accessible via internet; also many companies have their own sites. There are also many newspapers with job advertisements. Manual application requires work with copying documents etc. This is mainly an increased administrative burden, not a skill, but it does require persistence on part of the service user.

Case 2. Service area: Education throughout your life. Scenario: You are about to start your university studies and want to apply for financial aid (student loan).

Electronic service	Manual service
<p>Orientation: Found as first link on first search</p>	<p>Orientation: knowing which organization handles these issues; finding addresses and telephone numbers</p> <p>Investigation: more time consuming, requires finding addresses and telephone numbers. Requires 4 calls to order 4 pieces of information</p>

The manual service requires personal ID number to be collected before any information is given. The eService was not complete, the application had to be sent manually, hence no improvement in “Implementation”

Case 3. Service area: To move and to live at a new home. Scenario: You are 27 years old, unemployed, and have a child who is two years old. You wish to apply for housing allowance.

Electronic service	Manual service
<p>Orientation: Found as first link on first search</p>	<p>Orientation: knowing which organization handles these issues; finding addresses and telephone numbers</p> <p>Investigation: more time consuming, requires finding addresses and telephone numbers.</p> <p>Choice: no support (the eService has a calculator for simulation of alternatives)</p>

An automated voice system, part of the manual service, presents a long list of choices, and hence imposes a cognitive burden. The eService was not complete, the application had to be sent manually, hence no improvement in “Implementation”

Case 4. *Service area: To move to Sweden. Scenario: You wish to apply for a work permit in Sweden; you come from a country outside the EU. You do not speak/read Swedish.*

Electronic service	Manual service
<p>Orientation: Found as third link on first search</p> <p>Implementation: Easier, as the online application tool changes depending on your previous choices, if you wish to apply for a permit to work 3 month or less you will also automatically get fields in the application to apply for a visa.</p>	<p>Orientation: knowing which organization handles these issues; finding addresses and telephone numbers</p> <p>Investigation: Heavy cognitive burden to remember all information given over telephone. Alternative is to visit; time consuming and potentially expensive.</p> <p>Implementation: Requires more knowledge about alternatives than the e-version</p>

There is no comparison tool in the eService; hence the electronic service is no better than the manual one in the Choice phase. An online application form makes the eService much quicker to completion. The eService provides better overview of the information as it can be reviewed more easily, and several times.

Case 5. *Service area: To travel. Scenario: You want to travel from Örebro to Kiruna.*

Electronic service	Manual service
<p>Orientation: Found as first link on first search</p>	<p>Orientation: knowing which organization handles these issues; finding addresses and telephone numbers. Not all airlines and train companies were listed in the telephone book and hence required extra effort, e.g. going through a travel agent</p> <p>Investigation: As there are numerous options the manual service requires excellent cognitive skills or rapid handwriting to write things down while talking on the phone.</p> <p>Choice: The eService contains an automatic tool for comparing prices, the manual service requires user calculations</p> <p>Implementation: Requires telephone call or visit, or both.</p>

In the manual service, the automated voice response system did not recognize the name of the destination.

Case 6. *Service area: To influence politics. Scenario: You are engaged in environmental issues and want to find a way to forward your opinions to a political party or to a politician.*

Electronic service	Manual service
<p>Orientation: There is no direct link as there is no specific service. Requires knowledge comparable to manual service</p>	<p>Orientation: There is no direct link as there is no specific service. All parties have to be contacted individually.</p> <p>Investigation requires considerable skills in verbal communication plus determination to get through</p> <p>Implementation: directly contacting a politician requires sending a mail. The alternative is a "Suggestions" box at the office, but these suggestions will be filtered by office staff.</p>

This was not really easy in either case. There is no way in either system to directly find the right politician; one has to know her beforehand. Actually sending a message is very easy in the electronic case, but knowing it is sent to the right person requires investigation such as browsing numerous web sites. In the manual system there is no way to know the message actually reaches the politician.

Case 7. Service area: To plan retirement. Scenario: Calculate when you should retire so as to optimize your income/free time.

Electronic service	Manual service
<p>Orientation: Found as first link on second search</p> <p>Investigation: Finding information required installing an e-identification.</p> <p>Technical skills: download e-Identification program. Does not work with all browsers</p>	<p>Orientation: knowing which organization handles these issues; finding addresses and telephone numbers. There was no way to find out by using the phone book.</p> <p>Choice: Information given over the phone was not enough to plan unless the user has all knowledge about how the system works. Physical meeting is required. The first advice from the office was to go to the web site (!)</p>

Case 8. Service area: To start a family and have children. Scenario: Apply for parental benefits to be able to take a leave of absence from work and raise a child.

Electronic service	Manual service
<p>Orientation: Found as first link on first search</p> <p>Investigation: Finding information required installing an e-identification.</p> <p>Technical skills: download e-Identification program. Does not work with all browsers</p>	<p>Investigation: To plan parental leave, the online application is advised (!), the alternative is a personal visit to the office</p> <p>Choice: No assistance, so skills in mathematics needed, plus knowledge about the rule system and the time to do the work. Cognitive burden to remember parameters and estimation model as told over the phone. Alternative is to visit office.</p>

Case 9. Service area: To seek treatment because of illness. Scenario: You have come down with a rash/eczema and you need to find information about recommended treatment.

Electronic service	Manual service
<p>Orientation: Looking for “Pharmacy” gives a first link hit on the first search, but searching for the ailment specifically gives numerous hits as there are many information providers.</p> <p>Investigation: There is no single source to find the correct treatment and information about the treatment without beforehand knowledge about which medicine to use.</p>	

Pharmacies are easy to find physically and have most information, hence going through the web may be a detour if you need the medicine instantly (it can be ordered

electronically, however). Provided the solution can be found at the pharmacy, the manual service is easiest to use. There are many web sites, so information overload or interpretation problems may occur using the electronic service.

Case 10. Service area: To buy merchandise and services. Scenario: You have just started a new course at Örebro University and wish to buy the literature needed for the course.

Electronic service	Manual service
Orientation: Found on first search, no single best hit as there are many providers	Orientation: Requires knowing what bookshops there are selling the particular books wanted Investigation: Requires phone calls or visits Choice: No easy way to compare prices Implementation: Requires visit.

The manual service entails cognitive burden to remember prices, or administrative burden in writing everything down. The eService contains an automatic tool for comparing prices.

As the above listing shows, the electronic service version scores clearly better when it comes to the contents of the service and the service process. Many problems with manual services have to do with the Orientation phase; eight out of ten manual services scored worse than the electronic one in this phase. In most cases, the appropriate electronic service was found as the first link found by entering obvious key words in the search engine. In two cases there was no single best site to find as there were many service providers and there was no specific service designed to meet exactly with our scenario (health care, politics). Manual services, on the contrary, required knowledge of which organization handled which service and/or skill in locating this organization.

The Investigation and Choice phases are also most often easier in the electronic version, in seven cases for Investigation and in six cases for Choice. The reason was typically that all information was presented directly and because there are calculation tools. Direct information presentation is easier as making inquiry requires some knowledge and often imposes a cognitive burden. For example, often all information is indeed available in the manual service, but the typical process is that the officer first asks about user details and then presents just one alternative. As there is often more than one solution (such as different medical treatments or different kinds of visas), in this case the user needs to know beforehand about alternatives to be able to ask about them. In the electronic version, the user can typically see all the options as well as the criteria regulating the service and decide which alternative suits best. As for Choice, printed brochures provide only one or a few examples of outcomes of different choices but the electronic version often makes it easier by allowing simulation using exactly the data pertaining to that user data, playing around with alternatives to see how various action choices will turn out. It also provides certainty as the user will know the different outcomes are correct. Using the information in printed brochures requires her to make calculations on her own, which may induce error. Calculation requires skills in mathematics and knowledge about the rule system. For many people this is a huge barrier; the calculation is typically a formula based on

several factors and often including indirect effects such as tax reduction and effect on some other benefit. In the electronic service they only need to insert the correct data, which is typically known.

In the Implementation phase, the differences between the service versions were not great. This was often because the e-service was not complete, there was no electronic form return system so the user had to print out the form and send it in manually.

The only service where the manual version was clearly better, at least under some circumstances, was number 9, finding the right treatment for an ailment. Provided there is a pharmacy in your village, your ailment is not complicated, and the solution is using a drug available at the pharmacy, this is the easiest way. In other cases, problems may occur. As opposed to government agencies, pharmacies are publicly well known so there are typically no orientation problems.

Service number 6 turned out to be special as there was no way in any of the service versions to complete it without considerable effort. The politicians were hidden behind their parties, and only personal acquaintance can guarantee a direct contact. However, the electronic service is easier to use as there is no need to argue with party staff to get through; social and communicative skills are less necessary. Finding the right politician is, however, difficult and requires considerable searching. In the electronic system there is of course the option to email everybody, but we ruled that option out as being inappropriate.

4 Conclusions and Discussion

The hypotheses we investigated were:

1. The need for skills and knowledge *increases* when services become electronic.
2. The need for skills and knowledge *decreases* when services become electronic.
3. The nature of the skills and knowledge necessary *changes* when services become electronic, so that some people skilled in manual services might encounter problems with the electronic ones, and some having problems with the manual services might find it easier using the electronic ones.

As detailed in the Findings section, the need for knowledge and skills regarding the service content and procedures were generally less for the electronic services. Hence we find most support for hypothesis 2 – in eight out of ten cases the electronic service was easier to use in this respect. Hypothesis 1 is not supported generally; however in one case it can be argued that the electronic service required more knowledge. The differences would have been even greater if all electronic services had been complete; often the last part, sending in a form, had to be done manually.

However, in the case of complicated efforts, such as “influencing politics”, hypothesis 3 may be most relevant. In that case, verbal skills were no longer necessary but considerable skill in searching for concealed, or at least not directly available, information on the web was necessary.

Clearly our sample of services is small, given the large set available, and hence we can only provide indications here. Yet, as the examples we found are quite standard in their design, following standard practices, it can be assumed that the same kind of problems appear also in other services.

We conclude that electronic services indeed relieve the user of some requirements for skill and knowledge, and hence one obstacle to inclusion has diminished. Consequently more people will be able to use services as there is less need for administrative literacy. The cost for that improvement is obviously acquiring basic computer skills. However, the results are encouraging as computer skills are increasingly common whereas administrative literacy rather becomes more complicated as society evolves into more complex regulations, and as at any point in time there will be differences among the public in administrative literacy.

One implication of this conclusion is that the increasingly used measure of “administrative burden” should be completed by the kind of measure we have used here, “requirements for administrative literacy”. This is fairly easy to measure objectively, as it pertains to objects in services not to users’ ability, and is of great importance for inclusion in the e-society.

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Access Control in Federated Databases: How Legal Issues Shape Security

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Abstract. This paper will examine how legal considerations arising from the aggregation of data impact upon technical access control mechanisms. Research findings are based on a multi-disciplinary investigation of security issues regarding the aggregation of data in a governmental federated database system. The researchers conclude that the development of a federated architecture must consider technical security concerns within the context of legal risk management issues. As such, a holistic approach to the investigation of information security is required that incorporates the disciplines of information technology and law.

Keywords: Legal, societal and cultural aspects of eGovernment; Inter- and multidisciplinary research – issues and examples, Enterprise architectures and whole-of-government approaches; Trust and security: provisions and instruments.

1 Introduction

In this paper, we outline key issues regarding the development of a Queensland Government federated database system to aggregate geo-spatial data. Specifically, we focus on how legal risk management concepts, such as, liability and compliance, impact upon technical architectures. The paper will then proceed to outline how particular legal issues, such as, information management concerns and public record keeping requirements can shape the form and location of access control measures.

This paper aims to contribute to the development of federated database systems in government by highlighting the interdependent relationship that the disciplines of law and information technology have on each other, which can affect overall architectural design and subsequent implementation of security measures. It is likely that federated database systems, to aggregate data of all kinds, will become a common feature of e-government data sharing projects given the traditional “silo” based information structures of government agencies. As such, it is important to identify all potential constraints to development and include technical, legal and other concerns that may inhibit the successful implementation of federated database projects. Whilst the paper

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is focused on research conducted within Queensland Government, many of the concepts outlined have potential application in other jurisdictions because the issues raised are not unique to the Australian situation. The issues highlighted in the paper are equally applicable to governments throughout the world, especially those that are aiming to establish federated database systems to aggregate geo-spatial data. The paper provides an indication of how fundamental legal concepts can shape security designs and future research will make further contributions to the literature by examining some key e-government issues, such as, multi-disciplinary research models, information sharing and implementation strategies.

The paper is structured as follows. In Section 2, we outline the background to the project including the purpose of the research and the methodology adopted. Section 3 briefly details Queensland e-government initiatives within the context of Australian geo-spatial data development. Section 4 provides an overview of the proposed technical architecture. Section 5 provides a high level examination of legal concepts that are relevant to the technical architecture and the aggregation of data. Section 6 outlines key information security issues, with particular focus on access control measures and describes how legal considerations impact upon design and implementation. Finally, Section 7 concludes the paper and briefly details future work.

2 Background

Governments throughout the world have been collecting geo-spatial information for a number of years. However, it is not until relatively recently that governments have started to realize new applications for geo-spatial data held under their custodianship. This is primarily due to technological developments that have made the aggregation of data more feasible and more readily realizable. In particular, it is now widely recognized that benefits can be gained from the aggregation of geo-spatial data which provides new insight for policy making and opens up new commercial opportunities by bringing together different data sets and overlaying data into a single geo-spatial representation [21].

Problems can arise in the aggregation of geo-spatial data in government federated database systems because existing data has traditionally been collected and held within separate agency “data silos” [22]. Thus far, geo-spatial data has generally been collected for the individual purposes of different agencies rather than for the benefit of government as a whole. As such, individual agency data collection has been conducted independent of other government agencies. Concerns are further compounded because it is common for each individual data silo to have different data life-cycles and to be subject to different information management and security frameworks. The development of a government federated database system for the aggregation of geo-spatial data therefore has technical issues enmeshed with legal and risk management concerns involving information management [23].

Researchers from the Queensland University of Technology’s Information Security Institute have embarked on a three year research project with Information Queensland [14] funded by the Queensland Government’s Department of State Development [7] and the Smart Internet Technology Cooperative Research Centre [27]. The aim of the project is to develop a unified security and legal framework for Information

Queensland. The framework will incorporate multiple agency geo-spatial datasets even though each dataset will have their own individual security and information architecture.

We adopt a multidisciplinary methodological approach to security that encompasses technical analysis with legal and risk management issues. A comprehensive technical analysis involves consideration of possible security architectures for access control. Legal research entails an investigation of different areas of law that could impact upon the consideration of those security architectures, such as, information management concerns, public recordkeeping requirements and liability issues. During the first phase of the project, both disciplinary groups undertook reviews of the extant literature to obtain an understanding of key issues. Qualitative semi-structured interviews were conducted with key Queensland Government personnel to gain knowledge about the current technical/legal/risk environment at an agency level and to further research input into the design of the technical architecture.

3 Queensland E-government Policies and Australian State Government Geo-spatial Data Projects

A major goal of the Information Queensland initiative is to provide greater public access to Queensland Government geo-spatial information via the Internet. Fulfillment of this goal requires the development of a federated database system which is aimed at establishing interoperability of communications and information systems to enable information sharing across various agencies. Ultimately, it is envisaged that the Information Queensland project will lead to the development of a whole-of-government publication strategy for geo-spatial data [15].

The development of the Information Queensland federated system must conform to the overall strategic e-government guidelines set by the "Smart Directions Statement" [25]. The purpose of the statement is to assist whole-of-government decision-making regarding the strategic use of information and ICTs to provide effective and efficient services for the public sector, the private sector and the general community. The Statement consists of five focus areas that reflect overall whole-of-government aims and indicate integral issues to address regarding the development of Queensland e-government initiatives.

The first focus area is the notion of "government as a single enterprise" to enhance service delivery and to achieve more effective use and value from ICT resources. The second focus area is the "enabling of the business priorities" to improve accessibility to government information and services through a range of innovative service delivery channels. Improving value for money is the third focus area and this recognizes the obligation that Queensland Government has to its citizens to optimize efficiency and effectiveness in its ongoing strategic information and ICT investments. Focus four highlights the need to develop the skills base and individual capabilities of Queensland Government personnel to ensure the continuing delivery of responsive services. Finally, focus area five recognizes the benefits that can be realized through partnering with the private sector to identify new ways of doing business and to enhance the implementation of ICT-based strategies, projects and services.

The Smart Directions Statement is augmented by the "Government Enterprise Architecture (GEA)" which is a management framework to focus the implementation and use of ICT resources within individual agencies and government as a whole [8]. Effectively, the GEA provides a federated overview of Queensland Government as one single entity whilst recognizing that it is composed of autonomous agencies, who have their own responsibilities, but who are still able to contribute to whole-of-government investments. The GEA seeks to do this by providing a set of policies and decision guidelines for the use of processes, data, applications, and infrastructure. The GEA therefore assists individual agencies within the whole-of-government enterprise to create systems which will achieve the overall goals of the Smart Directions Statement and, at the same time, will allow agencies to interoperate with each other.

The development of Information Queensland should not just be viewed solely as a consequence of the Smart Directions Statement and Queensland Government's continuing enthusiasm for e-government initiatives. Several Australian state governments have developed projects to aggregate and publish their geo-spatial data to wider audiences via the Internet. For example, the Western Australian (WA) state government has embarked on a project called the Shared Land Information Platform (SLIP) which will eventually provide public users with access to over 100 different geo-spatial data sets held by 15 different agencies [13]. The data sets include a diverse range of geo-spatial information including details of native vegetation, public drinking water sources, bush fire services and location of aboriginal communities [11]. The WA Government is also seeking to utilize SLIP for a number of cross agency initiatives which seek to enhance some of the integral functions of government such as emergency and national resource management [12].

The New South Wales state government has also developed the Community Access to Natural Resources Information (CANRI) Program which has been in place since 2000 [18]. The CANRI project provides a web mapping browser in which it is possible to overlay different geo-spatial data sets, such as administrative boundaries, river catchments and threatened flora, over a map of New South Wales. CANRI involves all relevant agencies who have a natural resources role. A number of different data sets are accessible but the amount of data that is available for aggregation in one map is limited. Another project worth mentioning is the Northern Territory Government's Northern Territory Land Information System (NTLIS) which is a "collaborative arrangement between NT Government agencies designed to deliver better outcomes for government, the community and industry from the use of spatial data resources [19]".

Furthermore, the Australia New Zealand Land Information Council (ANZLIC) has developed the Australian Spatial Data Infrastructure (ASDI) which is a national framework for the maximizing the use of Australian geo-spatial data at a national level by providing a means to link the users and the providers of Australian-wide geo-spatial data and by developing best practice policies and guidelines [1].

Accordingly, the development of the Information Queensland project can be viewed as (a) a consequence of the Queensland Government's e-government ambitions (b) a reflection of ongoing geo-spatial developments that are taking place within Australian state governments and (c) a part of the continuing development of the ASDI. All of which have a goal of making geo-spatial data more readily available to the public.

4 Information Queensland Technical Architecture

The Information Queensland project is still undergoing continuing development and the data that is available to aggregate is currently limited. The types of data currently available from the portal include city road maps, local bus routes, local hospitals and schools, unemployment rates and meteorological data. Other information in a non-aggregated form that is also available from the portal includes property valuations and sales values, planning development zones and even fire ant location warnings. As such, the Information Queensland technical architecture has been structured to facilitate continued growth. Figure 1 details the proposed technical architecture for the Information Queensland federated database system.

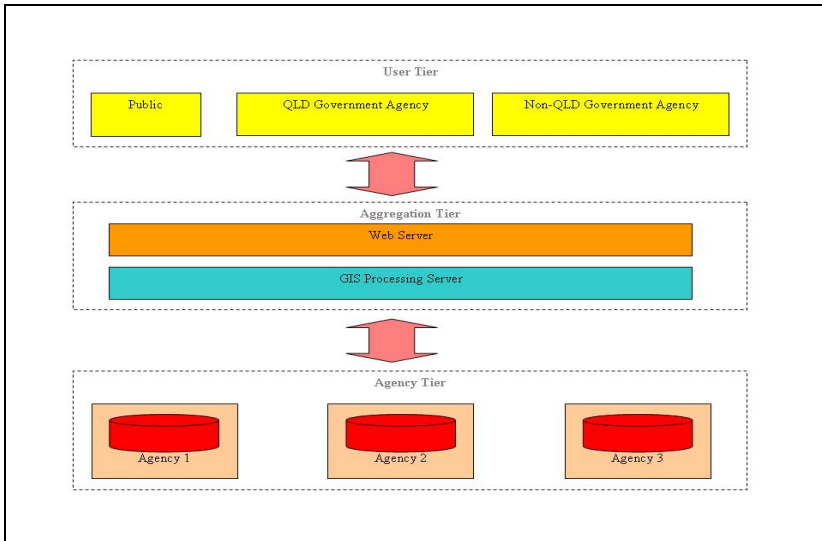


Fig. 1. Technical Architecture

The architecture is composed of three tiers:

- The Agency Tier: At the lower level, the Agency Tier consists of the different government agencies that provide geo-spatial data to be aggregated. The agencies hold the data within their own information systems and have custodial responsibilities over the stored data. The data is transferred from the agencies to be aggregated in the next level of the architecture;
- The Aggregation Tier: At the mid-section, the actual aggregation of agency data takes place. It is likely that the tier will consist of a geo-data processing server that aggregates the data and a web server that publishes the aggregated output to the User Tier. Effectively, the Aggregation Tier mediates between user requests for data and agency responses. User requests are decomposed and data requests passed on to the appropriate agencies. Individual agency responses are aggregated and served back to users; and

- The User Tier: The highest tier represents the users of the system. The project has been structured into different phases that gradually expand the user network from internal agencies to include other government agencies and eventually to the public. Users will be allowed to make requests, typically through a web browser, and view aggregated outputs.

The arrows represent the flow of data and communications between all three layers. In practice, request communications flow down through the architecture whilst data is pushed up to satisfy requests.

5 Legal Concepts Arising from the Aggregation of Data

Two legal concepts are prevalent to the development of the technical architecture and the subsequent aggregation of data – future liabilities arising from the publication of erroneous information and compliance with existing relevant legislation and standards. Both of these concepts are relevant because the ultimate output for the aggregated data will be the public.

Traditionally, data access within government has been restricted to users within an agency, but with an integrated system, the pool of potential data users is widened substantially. It is clearly understood within government, that one agency can not sue another agency if the integrity of information is not maintained. If information published by one agency is published to another agency and the second agency acts upon or relies upon the information published by the first agency, the second agency cannot bring proceedings against the first agency. This changes when government publishes information to third parties outside of government because liabilities can flow from reliance upon inaccurate information. In turn, this can impact upon the location and the design of information security measures used to secure the technical architecture.

The publication of incorrect data gives rise to liability issues under contract law (i.e. misleading or deceptive behavior), tort law (i.e. negligence or negligent misstatement) or from a specific statutory provision that places certain obligations on the accuracy or correctness of data and how that data should be used [3]. Liability issues are further complicated in federated database systems used to aggregate data because different datasets and different map layers may have varying degrees of accuracy [16]. Given the federated nature of aggregated data distribution, it can be problematic to establish which particular piece of data is responsible for an error, and in turn, which organization is responsible for supplying the inaccurate data. From a government organizational and legal risk management perspective, the issue at the heart of liability is therefore who is legally accountable for providing the erroneous data [2]. This is an important point. In theory, a legal action will be brought against government as a whole, but in practice, funds to cover the legal action will have to be found from existing agency budgets. It is likely that the agency that provided the incorrect data will ultimately bear the burden of paying legal fees for a subsequent action.

Although there has not been an Australian case regarding liability from the aggregation of geo-spatial data, it is likely that a future legal action would refer to US case law regarding the accuracy of maps given the analogous nature of common law

analysis [4]. Under US law, it is possible that liability for inaccurate information can arise from inaccurate maps where (a) a map is based on erroneous data and (b) where a map is based on accurate data but the representation of that data is inaccurate [9]. This is a distinction between issues of data content and issues of data context [2]. Issues of data content refer to the accuracy of data itself. Issues of data context refer to the notion that the aggregated representation properly represents the data upon which it is based, i.e. the map, or in this case, the aggregated spatial output is an accurate representation of the agency data provided. This point is critical because potential liabilities may arise in both the data held by agencies at the Agency Tier and by the subsequent aggregation of that data in the Aggregation Tier.

Information management structures are therefore a key concern in the legal analysis of the technical architecture and the aggregation of data. It is important that these structures are compliant with existing information management standards because this can be a method of mitigating potential liabilities [26]. An organization that has complied with recognized standards will have a stronger argument in any future legal action because it can claim that it took all possible actions to avoid a risk of harm from arising [5]. This is particularly relevant in Queensland because Section 35 of the Civil Liability Act 2003 (QLD) [6] acknowledges the financial constraints that public authorities face and recognizes that an agency can only provide a level of service that it is funded to provide. If an agency can show that it has properly exercised its functions and it can demonstrate that it has complied with general procedures and applicable standards, then Section 35 could have the effect of mitigating liability because the subsequent harm was beyond the resources available to the agency.

Compliance issues also arise in situations where government agencies are obliged by legislation or regulation to act in a specific way. For example, the public good emanating from accurate recordkeeping by governmental organizations is recognized by the statutory obligations placed on agencies to record, maintain and destroy records within certain guidelines. Queensland Government is no exception. The Public Records Act 2002 (QLD) [24] provides guidelines for agency recordkeeping which are supported by a range of information standards. Furthermore, the Queensland Financial Management Standard 1997 [10] engenders a governance framework that applies to all Queensland State Government agencies which requires that an agency develop a strategic and operational plan for each financial year. The Standard also requires agencies to implement key information security measures. Section 70 requires agencies to develop information systems to provide for certain fundamental elements such as access controls and audit trails. Section 71(1) requires that an agency must develop and implement internal controls to ensure the effective, efficient and economical management of the agency's resources and to accomplish the agency's strategic goals. With regards to security of information systems, Section 71(2) requires agencies to provide for certain mandatory internal controls such as authorization and authentication mechanisms.

An examination of these two underlying legal concepts reveals an understanding of how legal principles can impact upon the design of technical architectures for the aggregation of data. We will proceed now to show how legal issues – data custodianship, retaining public records and financial management – can affect the design of specific information security measures.

6 Legal Issues That Shape Security Measures

As highlighted above, the information management structure used within the technical architecture is a crucial concern both in terms of future liabilities and compliance with existing laws. In Australia, the custodianship model is becoming the prevailing information management system to co-ordinate and provide a control structure for the effective management of aggregated data [20] [17]. A data custodian can be defined as a public official who has physical and legal custody of data, and public records, and holds this information on behalf of a corporate entity or government agency [4]. Information management responsibilities are concentrated in data custodians and their role is essentially to be an information trustee that holds government data for the benefit of the public. Individual agencies retain custodianship over particular data sets but whole of government endeavors are made easier to realize through the standardization of corporate-wide practices that reduce duplication of data and maximize value added product development [5].

On a day-to-day management level, data custodians ultimately decide what data is collected, aggregated and released to the public. Data custodians are based at the Agency Tier and are responsible for data quality (including the integrity, security and confidentiality of data), availability of data and access to data. As such, they play a key role in the development of a security structure for a governmental federated database system used to aggregate data. In turn, the development of a federated aggregation system impacts on the data custodian model because custodians do not have total control over the uses of their data.

The data custodianship concept remains unchanged if the agency has management control over the data retained in its possession. However, when the data leaves the agency, as it does in a federated database system, that management control passes from the agency because another organization now has the opportunity to modify, manipulate or delete their data. Furthermore, agency data custodians cannot be accountable for potential liability arising from data context, i.e. inaccurate spatial representations based on accurate data, because the aggregated data is effectively outside the control of agencies. Therefore, it is unlikely or at least very difficult for the agency data custodian concept to apply to aggregated data outputs produced in the Aggregation Tier.

Limited or no custodian responsibilities at the Aggregation Tier also has consequences for the design, location and use of security measures because data custodians have a responsibility to ensure appropriate security procedures for their data. In Queensland, as highlighted above, this is mandated by Section 71(2) of the Financial Management Standard. Data custodianship is therefore legally relevant to security issues regarding authorization policies.

Authorization policies across different agencies may vary widely. Agencies are generally unaware of what other data will be used with their data to form an aggregated output. It is therefore difficult for an agency to devise authorization policies that predicate on aggregate data. As such, harmonizing established authorization rules at the Agency Tier for future adoption and use in the Aggregation Tier is a major challenge.

It is also likely that there will be different data classification schemes used by individual agencies. Inconsistent data classification is a potential problem because

different agencies can apply different classifications to the same data or can use the same classifications for different data. Even assuming that different agencies could develop a consistent data classification scheme, another concern arises with the aggregated information itself. The aggregation of data contained in separate data sets may indicate information which is not intended for disclosure. For example, combining electricity grid and water reticulation maps may reveal information that would normally be made secret for defense and security related reasons.

Data custodianship concerns also impact on the positioning of access controls. As there are different government agencies, each with a significant number of data sets, it is important to consider where authorization and authentication should be performed:

- (a) At the Aggregation Tier; and/or
- (b) At the Agency Tier, either at the agency's perimeter (e.g. web services gateway) or at the point of access to the data (i.e. using built-in data base mechanisms).

If authorization policies are produced at the Aggregation Tier only, this may not be consistent with agency data custodial responsibilities. Furthermore, it is far from clear who will be accountable for devising policies as existing management structures are based at the Agency Tier. If authorization policies are created at the Agency Tier only, this precludes the application of authorization being considered for aggregated data. It seems unlikely that individual agencies would be considered wholly responsible for access control over data which they only partially hold, so they would have a limited role in determining access control rules for aggregated data. This responsibility would be better suited to the Aggregation Tier. It can be concluded that effective authorization policies should incorporate both policies from individual agencies, for data directly under their control, as well as policies by a different organization at the Aggregation Tier for aggregated data. However, this is an area requiring further research from both a legal and an information security point of view.

If authentication is performed at the Aggregation Tier, on behalf of the agencies, then the access control functions performed by agencies are critically dependent on the organization bearing management responsibility of the Aggregation Tier. Again, this may not be consistent with individual agency custodial responsibilities. Furthermore, the consequences of compromise of the authentication service are important. If the authentication service is compromised then this exposes the data of all of the agencies. If however authentication is performed at the Agency Tier, for aggregation requests which require data from multiple agencies, authentication is performed in each agency, reducing the efficiency of the request processing.

It is also questionable whether the instigation of authentication mechanisms solely at the Agency Tier will fulfill the requirements of the Financial Management Standard and the Smart Directions Statement. Under the Standard, an agency must develop a strategic plan for the use of ICT resources within a whole of government context. In particular, the plan must evaluate the agency's requirements regarding existing and additional ICT resources and state how the agency will optimize the use of, and fund, existing and future ICT resources. It is not clear whether housing multiple authentication mechanisms at the Agency Tier, for each agency, would fulfill those financial management obligations that require a whole of government outlook.

The practical legal effects of data custodianship also manifest in recordkeeping and the retention of public records concerns. The recordkeeping and retention of public records is legally necessary to provide historical records, for example, evidence in the case of disputes arising over data alleged to have been obtained. Moreover, the Public Records Act places wide-ranging obligations on agencies to keep records of their activities. Section 6 of the Act defines a public record in a broad manner to effectively cover any information generated or received by an authority within its normal duties. A public record can also include a copy of a public record. Section 7 of the Act mandates agencies to keep full and accurate records of its activities. Section 7 also indicates that public recordkeeping and archiving activities should be in compliance with relevant standards and guidelines.

The legal issue of recordkeeping and retention of public records is probably of a lesser concern at the Agency Tier because the individual agencies should already have recordkeeping and record retaining functions in place as part of their normal day-to-day management activities. The supply of data from an agency to the Aggregation Tier could be classed as an activity of an individual agency. If that is the case, agencies may be required to keep full and accurate records of the data provided. Furthermore, given the potential liability issues arising from aggregated representations (i.e., data context accuracy), it would be legally advisable to keep records for every transaction between the Aggregation Tier and the User Tier, particularly involving members of the public, so it could be definitively proven which aggregated representation was provided to which user. This evidence would be crucial in any subsequent legal action.

A method to trace aggregated data is therefore required to identify and to correct source data. In other words, a mechanism may be needed, when it is provided with a piece of aggregated data, it identifies the component parts and the corresponding agencies from which that data was obtained. Being able to trace component data to its custodian may be essential in resolving liability disputes and who funds legal actions.

7 Conclusion

In this paper, we have outlined how fundamental legal concepts and interrelated legal issues can impact upon the design, the development and the location of security measures in a government federated database system for the aggregation of geo-spatial data. Legal and technical issues are enmeshed together because the legal concepts of liability and compliance need to be factored into the design of technical architectures. As such, it would be beneficial if the technical architecture took into account the possibility of future liabilities arising from aggregated publication at the very onset. Whilst it is possible to mitigate liability from the publication of incorrect data though purely legal mechanisms, such as disclaimers, the very structure of the technical architecture can also assist by acknowledging the crucial importance that information management systems have on technical and legal issues.

Specifically, this paper outlined how legal issues such as information management concerns, in the form of data custodianship, public recordkeeping requirements and financial management standards can impact on security mechanisms such as access controls, authorization policies and authentication mechanisms.

Whilst the research is focused on a Queensland Government project, the issues raised are potentially applicable to other governments both in Australia and in other jurisdictions. As regards Australia, Queensland is largely representative of the type of geo-spatial projects currently being developed. It is likely that the same fact situations and legal issues will arise among Australian state governments given the historical, organizational and legal similarities that exist between the different states. Internationally, the issue of liability is likely to vary by degree depending on the existing laws of each jurisdiction. It should also be noted that the various Australian state Civil Liability Acts are designed to provide a level of protection for public authorities regarding negligence claims. Despite that, our research has shown that liability issues may still arise and must be guarded against. Other jurisdictions may not have such protective legislative measures and may perhaps be more susceptible to potential liabilities. Regardless of the perceived strengths and weaknesses of jurisdictional legislation, our research highlights to governments everywhere the importance of sound information management structures and the integral part they play in technical development and legal risk management.

This paper represents research findings from the first phase of a three year project. Future work will continue to focus on the issues raised in this article and will ultimately seek to develop a multi-disciplinary methodological model that incorporates the academic disciplines of law, risk and information technology to provide a method of analysis, and a paradigm for discourse that frames research questions, regarding the aggregation of data in governmental federated database systems. This methodological model will provide a truly holistic outlook that recognizes and incorporates the different disciplinary requirements involved in the future development of governmental federated database systems and the subsequent aggregation of geo-spatial data.

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Public Sector Partnerships to Deliver Local E-Government: A Social Network Study

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Abstract. This research explores how UK local authorities and their partners work together in sub-regional e-government partnerships. The paper first introduces the literature in four key areas: local e-government, partnership working, local governance and social networks. It goes on to explain the methodology adopted during the study: comparative case studies of three sub-regional e-government partnerships using social network analysis and qualitative interviews. The findings from the first case study show that the partnership is working productively and is delivering a number of projects, but that the partnership is largely IT-led and has little representation from citizen-facing directorates. The initiatives being pursued have so far been essentially administrative reforms driven by efficiency and have yet to impact directly on the citizens of the sub-region. The emphasis has been on improving existing local authority ways of working rather than advancing local democracy or improving policy making.

Keywords: Public sector partnerships; Local e-government; Social Networks.

1 Introduction

An increased role for electronic government is a key element in the UK government's modernisation agenda, with the aim of improving local government efficiency and increasing its accessibility and responsiveness to local citizens. E-government is the use of computer technologies by government to transform the provision of services and information to citizens, encourage citizen participation and modernise local government. Local authorities have been encouraged by the government to develop e-government solutions in partnership with others. Literature from the fields of e-government and the diffusion of innovations suggests that participation in wider networks is a factor affecting successful e-government implementation. This research examines the network of relationships between individuals and organisations involved in sub-regional e-government partnerships in England. These partnerships variously involve officers from different departments within a number of local authorities, councillors and other public organisations such as police, fire and health services. The research explores how local authorities and their partners work together to implement electronic government, identifying the issues, challenges and successes. The policy contribution will evolve from an increased understanding of the social networks underpinning complex service innovation. This paper first introduces the literature in four key areas: local e-government, partnership working, local governance and social

networks. It then briefly introduces the first of the three partnerships studied for this research project. It goes on to explain the methodology adopted during the study: comparative case studies of three sub-regional e-government partnerships using social network analysis and qualitative interviews. It finishes with a description of the first of these case studies and presents the findings from that study.

2 Literature Review

Local Electronic Government. The UK government's national strategy for local e-government, published in November 2002, identified three central themes of local e-government: Transforming Services, Renewing Local Democracy, and Promoting Economic Vitality [1]. One element of the UK approach to local e-government has been the Partnership Programme, which funded 101 Local e-Government Partnerships between 2002 and 2006 with a total of £68 million. The Partnership Programme aimed to "deliver more effective, more efficient and more joined up local government services" [2]. In recent years, particular emphasis has been placed on the importance of local authorities working together with others in their region [3]. These Local e-Government Partnerships, the focus of this study, exist in a changing climate. The funding from the Partnership Programme, which has supported their activities, has ended. The national strategy for local e-government has reached the end of its term and local authorities now face new national priorities including the Transformational Government agenda, the drive for efficiency, a campaign to encourage citizen take-up and Government Connect.

Research into the adoption of e-government among local governments suggests that there are a number of factors influencing the sophistication and successful implementation of e-government solutions. These include: professionalism and attitude of the council leadership [4][5][6]; participation in wider networks beyond the immediate locality [7]; extent of support from other departments outside the IT section [8] and population size [9][10]. McNeal et al found that the involvement of state officials in professional networks was an indicator of e-government innovation, but that access to resources and citizen-related factors such as education level, voter turn-out and rate of internet use do not drive e-government implementation [11]. They conclude that e-government is largely an administrative reform, driven by officials seeking efficiency, rather than a mechanism for democratic participation. Local government has three distinct roles in its locality: as the champion of *local democracy*, the focus for *public policy making* and as a *provider of services* [12]. Pratchett's case study of an English local authority found that ICT policy making tends to be closed and exclusive, with an emphasis on efficiency savings and developing technology to support existing service delivery functions and a neglect of the local democracy and policy making roles of councils.

Partnership working. Both McNeal [13] and Ho and Ni [14] identify the need for future research seeking to understand the role of networks in the diffusion of e-government and other administrative reforms. Diffusion studies have found that an organisation's innovativeness is affected by its interconnectedness, "the degree to which the units in a social system are linked by interpersonal networks" [15]. This study is interested in the extent to which the organisations working in e-government partnerships are interconnected with one another, and will examine why some

individuals and organisations are more involved than others. A number of organisational factors may affect how involved a council gets in partnerships. Councils with larger populations have been found to be more likely to adopt more sophisticated form of e-government [16] [17] and it might be anticipated that these larger councils would be at the forefront of e-government partnerships.

Prior research on local partnerships suggests the importance of individuals to the activities and success of partnerships. Partnerships will be affected by the standing and activity of not just the partnership leaders, but also by other local leading figures and “brokers” [18] [19]. Partnership success and activity will also be influenced by the seniority of the individual representatives and their capacity to commit to decisions on behalf of their organisation. Staff working on partnership projects bring with them their own social networks or contacts, which can influence the introduction and implementation of policy [20]. Within social network analysis, there is a concept of boundary spanners or brokers. For example, in their study of an alliance between two firms, Hutt et al identified those who were “in the know”, boundary spanners with close and numerous ties both within their own firm and to those involved in the alliance [21]. The diffusion literature highlights the importance of innovation champions who occupy a linking role, understand the aspirations of others and have suitable negotiating skills [22]. This study will look at the role played by individuals, both those who act as boundary spanners, linking their organisation with others in the partnership and also those key individuals who act to drive the partnership forward.

Studies of local partnerships suggest that it takes time to establish the relationships and understanding required for effective partnership working. Partnerships are likely to be more effective in bringing organisations together if they are based on pre-existing collaborative arrangements or have boundaries which are co-terminus with existing organisations with a history of working together [23][24].

Local Governance: legitimacy and accountability. Leadership commitment has been found to be important in the adoption of innovations by organisations [25]. Specifically, the attitudes of the council leadership are an important factor influencing the extent and success of e-government implementation by local councils [26][27][28]. Historically, local authority departments have sometimes acted as “silos” concentrating on the delivery of individual services rather than having a broader citizen-focussed approach [29][30][31][32]. One factor which influences successful e-government implementation is the support from other departments outside the IT section [33]. If e-government partnerships act as IT silos, this could lead them to develop initiatives without sufficient reference to other local developments. The extent to which the partnerships are interconnected with other departments will be examined.

Social networks. Social network analysis is a useful lens for a study of partnerships. It focuses on “relationships among social entities, and on the patterns and implications of these relationships” [34]. This focus on the relationships between actors contrasts with a traditional focus by social researchers on the attributes of the actors. The data can be presented in sociograms, providing a clear picture of a complex web of relationships which could not so easily be reported or discussed textually. However, it cannot provide details of why the network looks the way it does or the meaning behind the surface of relationships. This study draws on the learning from earlier studies [35][36][37] which have used social network analysis and diagrams as tools to initiate

discussion in qualitative interviews and workshops. This will help create a richer picture than can be found from social network analysis alone.

3 Research Methodology

This case study focussed on a Local e-Government Partnership, one of 101 local partnerships funded by the UK government's Partnership Programme. This is one of three partnerships included in the research study, chosen to represent a diversity of geography, size and type of local authority, culture of partnership working and structure. The Partnership consists of 10 organisations: 5 neighbouring local authorities plus 5 public organisations operating in the area (police, fire, health, passenger transport executive and an organisation delivering some of the shared services residual from the defunct county council). Its activities include sharing information, identifying opportunities for new shared business initiatives and overseeing a number of discreet project groups.

Separate discussions were held with three long-standing members of the partnership to discuss the research idea, gather an initial impression of the sub-regional partnership and agree a list of participants. The criterion for inclusion was a current, on-going involvement in any of the committees or working groups that make up the Local e-Government Partnership. Snowball sampling was used to check this list and identify any further participants [38]: the list of names, together with a project plan was circulated to all those suggested, asking for any comments, deletions or additions. The final list included 37 people from the 10 organisations. A short questionnaire was distributed to all of the 37 people involved in the partnership. It was circulated and returned by email. Six questions asked about network relationships: frequency of communication, providing and seeking information and advice, influence, previous contact and knowledge of each other's skills. The remaining questions related to the respondent's involvement in the project and brief contact details. The questionnaire included a brief introduction which served to explain the purpose of the study and assure participants that their responses would be treated confidentially. Of the 37 questionnaires circulated, 32 were completed and returned. Information was analysed using UCINET 6 social network analysis software [39]. A workshop was held at an e-Government Board meeting and interviews were completed with 13 participants, including at least one person from each of the organisations involved in the partnership. Interviews were recorded on tape and later transcribed. They were analysed using NVivo software. The methodology and analysis is described more fully in a separate paper [40].

4 Research Findings

Benefits of working in partnership. Reported benefits of working together include sharing skills and knowledge, a better understanding of what each other does, and access to each others' resources and expertise. Shared work on the priority outcomes is felt to have helped local authorities deliver on these national targets.

"It is very difficult to quantify the benefits of collaboration from a knowledge perspective, because, you know, having these discussions and understanding what others

are doing, gives us some, maybe knowledge we wouldn't have had to help feed in to what we are doing. It is like an intangible benefit" (Interview).

The partnership has identified substantial efficiencies resulting from partnership working, for example by jointly procuring staff training. A few shared projects have already been introduced and others are being investigated or developed. One of the partnership's early projects was to combine capital resources to build a shared microwave network. The network is used extensively by the police and has been used to site police officers in council buildings. Discussions are underway about shared approaches to Geographical Information Systems and disaster recovery. A small sub-group are working on the development of a shared proof of age smartcard for young people. The partnership has developed broadband access for small businesses in one part of the sub-region and is discussing the development of a shared business database and a single business account. Some of the projects initiated by the partnership are reliant on take-up by other directorates for their success. The home working project, which has produced a network design and policy guidelines has not yet been expanded beyond the small number of ICT staff who took part in the pilot. The microwave network, which allows communication between partners, has many potential applications which could be explored in the future.

Partnership Connections

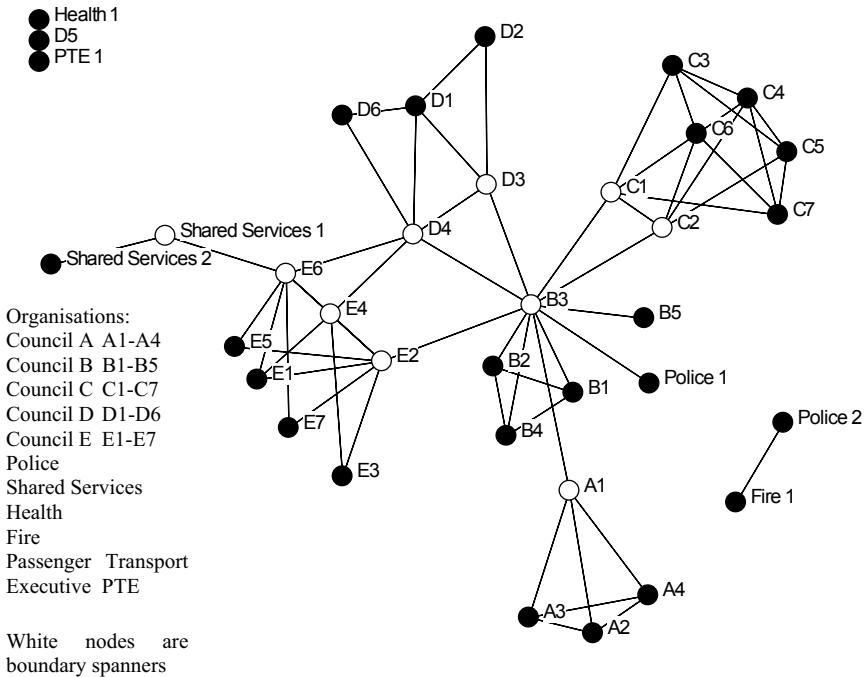


Fig. 1. Communication more often than monthly

Communication in the partnership. Everyone in the partnership was asked about the frequency of their communication with others: “How often do you typically communicate with the following people about e-government?” Figure 1 represents frequent communication. Most members meet at monthly meetings, so “more often than monthly” has been chosen to represent frequent communication. The data has been symmetrised, so a link is only recorded when both people report a connection. Arrowheads are not shown because the relationship is non-directional. Each node represents an individual. The connectedness of the main group in the diagram suggests that news and information about e-government can reach most participants fairly regularly. Of the 36 respondents, 20 communicate with three or more people each month. Within each local authority there is a high level of internal communication; with very few exceptions, most local authority representatives are in weekly or daily communication with their colleagues, allowing for a high level of information exchange and discussion. Between organisations, a number of individuals play an important role as boundary spanners, i.e. they are in regular communication both with members of their own organisation and with at least one other organisation. They are shown in white in Figure 1. Without these individuals their organisations would not be in such regular communication with others in the partnership. B3 plays a particularly central role; he is in regular contact with six people from five different organisations. There are five isolated individuals who are not in regular communication with the main body of participants. Four of the five are from non-Council bodies.

Knowing each others’ skills. Understanding each others’ skills is an important element of partnership working. Whether or not people are currently in regular contact, if they are aware of each others’ skills, they can quickly get together the right people for a particular project or can contact the people they need for advice or information. Participants were asked “About whom can you say ‘I understand what skills & knowledge this person has’?” In general, as might be expected, people were well aware of the skills and knowledge of those in their own organisation. Three people know the skills of over twenty others outside their own organisation, almost all of the other people in the partnership. Another twelve people know the skills of ten people or more. By contrast, more than a third of participants do not understand the skills and knowledge of anyone outside their own organisation, so would be unable to directly contact people e.g. for help and advice with a particular project.

Getting hold of information. Getting hold of accurate information in a timely fashion may be expected to help organisations work together. Participants were asked, “Who do you typically go to for information relating to e-government?” and “Who typically comes to you for information relating to e-government?” The results of these two questions, combined together, are shown in Figure 2. The lines represent information seeking. The size of the node indicates how many people seek information from that person; a larger node indicates someone from whom many people seek information; the smallest nodes indicate someone who is not sought out for information by anyone. There are 3 people in the partnership who are called on by more than 15 others for information. A further 5 people provide information to 10-12 others, 7 people provide information to 5-9 others and the remaining 21 people provide information to less than 5 others. Participants from Council A rely for all their information on A1.

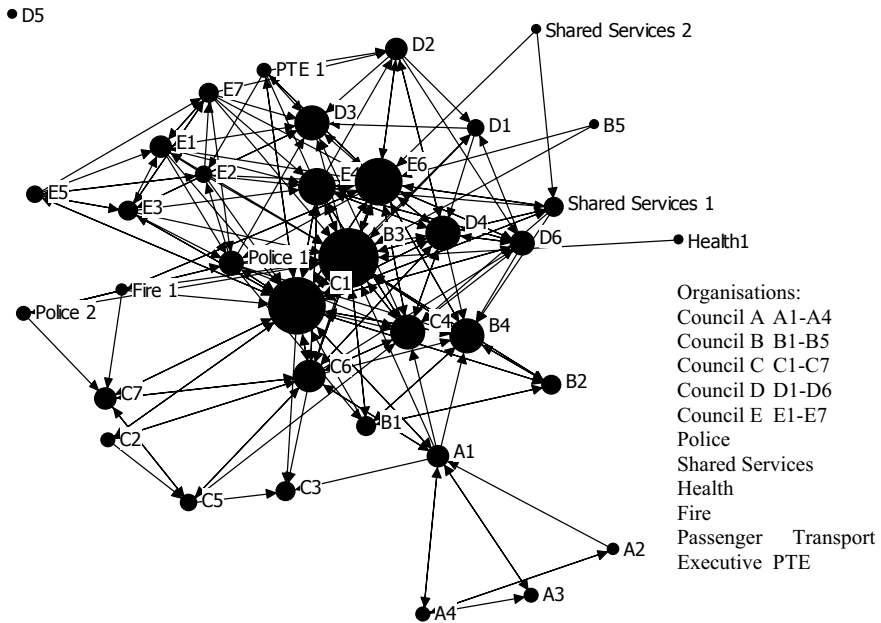


Fig. 2. Seeking information, sized by centrality

Partnership connections – an overview. Looking across all of these partnership connections – communication, providing information, knowledge of the skills of others – some people emerge as key figures in the partnership. These are the individuals who are in frequent communication with many others, provide information widely and have a good awareness of the skills and knowledge in the partnership. Three people are very central to the partnership, B3, C1 and E6. They are seen by others as key to driving the partnership forward:

“He is useful in building up the links to the other organisations, which I think is important in getting something forward like this ... you need somebody to be able to bring people together and embrace them and say we could do this together” (Interview).

“[name] is a driver. If he was no longer involved the partnership would flounder... He is the most valuable resource” (Interview).

These three all seem to be supported by their organisations to play this role. Two are relatively senior in their organisations and the third, while more junior, has been encouraged by a senior manager to play an active role, having been freed up from other commitments to focus on the partnership. All three are perceived by others as approachable, likeable and knowledgeable. If these individuals left or reduced their commitment and were not replaced, the partnership would suffer. B3 plays a particularly important role in the partnership: he communicates frequently with many people, knows the skills of more people and is sought out for information by more people than anyone else. Of the ten most central people in the partnership, nine are from the four most active councils and one is from the Police. His involvement was initially encouraged by having previously worked alongside B3, one of the three key activists.

He has been very involved over a few years in one of the partnership's projects, which may suggest that working together on a project strengthens a partnership more than simply sharing information and ideas. For the local authorities, their knowledge of the partnership is spread among a group of people, but for the non council organisations, it all rests with one individual. This reliance on one person makes their involvement vulnerable to changes in role or moves to new employment.

Who is involved in the partnership? 26 of the 36 participants are members of ICT departments. The remainder are a mixture of policy, communications and e-government managers. All of the organisations that have more than one person involved send at least one non-ICT representative. There are very few people who work in customer services or citizen-facing departments. There is no direct involvement of citizens or councillors. One person is from the private sector. Some of the projects initiated by the partnership are reliant on take-up by other directorates for their success. There are indications that these projects have not been adopted as widely as might have been anticipated. This makes it important to have clarity about how shared e-government initiatives are successfully planned and implemented, particularly when the partners work together to develop joint services for citizens, which will impact on directorates and organisations beyond those represented in this partnership. This issue is recognised and has already started to be addressed. The partnership now reports to the Chief Executives' group, who have agreed to provide "strategic guidance and adjudication" on "cross-cutting projects"¹, i.e. those projects which impact on other directorates not represented here, such as housing, social services or planning.

"One of the reasons for that is because when you are looking at a shared services agenda, even when it's very early days, you need the top level. So the idea is that business opportunities, technical opportunities come together, OK, and the opportunities are flagged up to the top table and the top table then says, yes we like that one, or no we don't like that one" (Interview).

Further clarity about the powers of the e-government partnership bodies and their relationship with each other and other partnerships beyond e-government could be helpful, including the development of an up to date e-government strategy for the sub region.

Leadership. Partnerships rely for their success on a commitment at the highest level. "This means the chief executive, with political approval, supporting the partnership approach in his/her own organisation and ensuring that the support is cascaded down through their organisation" [41]. Senior management play a key role in determining goals, signifying the importance of the network, creating a clear identity and galvanising support [42]. This study has focussed on those directly involved in e-government partnerships and so cannot comment in detail on the attitudes of chief executives. However, a few pertinent points arise from the research which can confirm the importance of having leadership commitment from the top. The initiative for setting up the local partnership came from one of the local authority chief executives. All of the chief executives meet together on a board, to which this partnership reports.

Changes in leadership attitudes were important drivers for partnership working for two of the partners. A senior officer from one council was clear that changes in the political

¹ Partnership internal report.

leadership of his council, together with a change of chief executive meant that he was now getting much more encouragement than previously to be involved in partnership with other councils. An e-government manager from another council perceived a changed attitude to partnership working from his council leadership following the award of a poor rating in the comprehensive performance assessment: there was a drive to raise performance by sharing the knowledge, skills and expertise of others.

Successful partnerships rely on leaders within the group to ensure that meetings are well structured, decisions are followed up on and regular communication is maintained between meetings [43]. Leadership roles are spread between the four most active local authority partners, with each taking on the chair of one of the partnership groups. The chairs provide leadership and continuity for the groups which helps keep them focussed. They are all among the group of boundary spanners in the partnership, in regular contact with others. Further research across the three case studies will explore the role of “opinion leaders” [44] whose centrality in the interpersonal networks puts them in a position to influence others. In some partnerships a co-ordinating role has been provided by funded dedicated programme management support, either by appointing staff or via consultancy. This partnership has decided not to go down this route.

Size of organisation. Among the local authority partners, the smaller councils appear to make a larger staffing contribution to the activity. Of the 10 key activists in the partnership 7 are from the three local authorities with the smallest resident populations and one is from the police. Of the 3 people who are at the forefront of activity in the partnership, there is one each from the three authorities with the smallest resident populations. This may be because smaller councils can see more gains from the economies of scale and sharing of knowledge offered by e-government partnerships. For example, in relation to discussions about a shared approach to disaster recovery, “Council D is a large City Council so they have resources that we can use and they are quite happy to share” (Interview). E-government research suggests that population size is a factor in adopting e-government, with large councils being more likely to adopt more sophisticated approaches [45][46], so it may be that the smaller councils lack the capacity to go it alone and are more likely to seek out partnerships.

Embeddedness. The literature indicates that partnership arrangements are influenced by social connections [47][48]. Therefore, it might be anticipated that there would be more frequent communication between actors who have previously worked or collaborated with one another prior to joining this partnership. A QAP correlation of the two databases for communication and worked together before indicates that there is some correlation between the two. The Pearson’s correlation statistic is 0.45. This indicates a high level of correlation, suggesting that actors are more likely to communicate more often with those they have worked or collaborated with before. Similarly, there is some correlation between seeking out information and having worked or collaborated together. There is a Pearson’s correlation statistic of 0.37 between these two databases, suggesting that actors who have worked together in the past are more likely to contact each other for information.

5 Conclusions

There is strong support within this sub-regional partnership for continued work together on e-government and a commitment to develop further. It takes time to build the relationships and understanding required for effective partnership working. The structures and relationships are now well-established, which should make any future work together easier. Some benefits have already been seen and more are anticipated by the participants. The partnership is reliant on a small group of people to drive it forward. There is also a larger group of boundary spanners, those with close ties both within their own organisation and to those involved in the partnership.

The e-government activity initiated by sub-regional partnerships will impact on directorates and organisations beyond those who attend the partnership. If the activities are to be relevant and successful, partnerships need to adopt a shared strategy, have clear lines of accountability and the relationship to other partnerships in the sub-region (and beyond) will need to be established. These issues will increase in urgency with the growing emphasis on shared services. Leadership is important to partnership activity, both in terms of commitment from chief executives and the need for leaders on the ground to drive the partnership activities forward. In this study, smaller councils appear to play a greater role in the partnership than larger authorities, possibly because they lack the capacity to develop e-government solutions on their own.

The findings from this first case study suggest that social networks can have some effect on the adoption and implementation of e-government. The case study throws up some possible answers to the questions arising from the literature review. Participation in this Local e-Government Partnership has contributed to: the sharing of knowledge and expertise among organisations; better awareness of what each other does; and substantial savings through joint procurement. A small number of shared projects have been introduced and it seems that the foundations have been set for further initiatives. Commitment from the leadership of partner organisations seems to have been a factor in forming and sustaining the partnership and has influenced how involved organisations have been. The case study suggests that “silos” still operate to some extent: the bulk of participants were IT managers and there does not seem to be a clear formal link into other customer facing directorates, although the extent to which there are less formal links from the partnership into their own organisations will vary. There are a few key figures in the partnership. They play a dual role of driving the group forward and acting as a glue to bring everyone together. Beyond this, there is a core group of “boundary spanners” who act as champions of the group in their own organisations and vice versa. There is no involvement of citizens or councillors in this partnership. The initiatives have so far focussed on administrative efficiency and cost savings rather than projects which will directly impact on citizen quality of life, but planned developments include the piloting of smartcards for young people. Echoing the findings of prior studies [49][50][51], the e-government activity of this partnership has focused on administrative reforms, driven by efficiency. In doing so, the partnership has neglected the democracy and policy making roles of local councils which could raise citizen participation and public accountability.

Further research is currently being undertaken with two other English sub-regional e-government partnerships. The issues highlighted by this study will be explored further in relation to these other partnerships to discover more about the importance of

social networks in implementing new programmes and the factors that contribute to effective e-government partnerships.

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Diffusion of E-Government Innovations in the Dutch Public Sector: The Case of Digital Community Policing

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Abstract. This article examines the diffusion of an e-government innovation – called SMS-alert – among Dutch police forces. A conceptual framework for the diffusion of e-government innovations in the public sector is developed which combines a functional and a constructivist (or cultural) approach of diffusion. The framework focuses on diffusion as a mutual process of communication, learning and sense making. Based on this framework and by using data from documentation, websites and interviews, the process of diffusion and adoption of SMS-alert is reconstructed and the factors and mechanisms explaining this process are identified. The case study demonstrates that although SMS-alert has diffused rather rapidly until now, the diffusion process is currently facing some difficulties, mainly due to the existence of competing innovations. By demonstrating the importance of both the functional, political and institutional meaning of the innovation, the article confirms the value of combining different approaches in studying the diffusion of e-government innovations.

Keywords: e-government innovation, diffusion, sense making, goodness of fit.

1 Introduction

In July 2004 the police force of the Dutch region Midden- and West-Brabant introduced a new warning and communication system, called SMS-alert. By sending text messages to mobile telephones this e-government innovation enables a police force to improve its service delivery and to change its interactions and relationships with citizens in terms of community policing [12, p. 425]. A better, location based service is provided because citizens are informed or mobilized in an early stage, for instance, regarding a missing child or a burglar on the run in a specific area. Moreover, SMS-alert facilitates a new safety concept, in which the citizen is mobilized to act as a co-producer of public safety. By being the eyes and ears of the police in the neighbourhood, citizens become engaged in the attack and prevention of local crime.

Three years after its introduction by the police force of Midden- and West-Brabant, SMS-alert has spread to several other Dutch police forces. By now, nine out of a total of twenty-six police forces have adopted SMS-alert and at least seven other police forces have voiced their interest in the e-government innovation. This raises the following research question: How can the process of diffusion of SMS-alert among Dutch police forces be described and explained?

Over the years, the spreading of e-government innovations from one (governmental) unit to another has been studied rather extensively by the business studies diffusion and technology transfer literature [15, 16], and the social psychology theory of reasoned action [7] and technology acceptance model [3, 20]. Although this functionalist literature has demonstrated the importance of innovation and adopter characteristics for the diffusion of an innovation, it does not place diffusion in a broader perspective. It insufficiently acknowledges that the cultural environment of an organization, as a reservoir of meanings which influences the legitimacy of organizations, can strongly influence its adoption decision, especially in the public sector [11, 17, 18]. Therefore, in this article, the process of diffusion of SMS-alert among Dutch police forces is described and explained by combining a functional approach with a cultural c.q. constructivist approach of diffusion [13].

First, some concepts and theories that are relevant to the study of e-government innovation diffusion are discussed. Next, based on insights from these theories, a conceptual framework for the diffusion and adoption of e-government innovations in the public sector is presented. This framework combines a functional and a constructivist approach of diffusion. Based on this framework the diffusion and adoption process of SMS-alert is reconstructed and the factors and mechanisms explaining these processes are identified. Finally, some conclusions are presented.

2 Defining and Explaining Diffusion

This section defines the concepts central to this study and discusses some theories relevant to the description and explanation of diffusion processes of e-government innovations in the public sector.

2.1 Defining Diffusion and Adoption

Two concepts are central to this study. First, the diffusion of an innovation can be defined as “a process in which an innovation is communicated through certain channels over time among the members of a social system” [16, p. 5]. It is important to make a distinction between the diffusion and the dissemination of an innovation. Whereas diffusion refers to the informal and “uncontrolled” spread of an innovation, dissemination refers to formally and centrally driven spread [8, p. 191-192].

Second, the adoption of an innovation can be defined as “the [voluntary and/or coercive] process through which [an organization] passes from first knowledge of an innovation, to forming an attitude towards the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision” [16, p. 20]. Organizations can adopt an innovation in varying degrees, ranging from copying an innovation without making any changes, to using an innovation as an inspiration [5, p. 52-53].

2.2 Some Relevant Theories

Over the years, the spreading of e-government innovations from one (governmental) unit to another has been extensively studied. Three important bodies of theory that

contribute to this research are the business studies diffusion and technology transfer literature [15, 16], and the social psychology theory of reasoned action [7] and technology acceptance model [3, 20]. Whereas the diffusion and technology transfer literature explains the adoption of (e-government) innovations by both individuals and organizations while focusing on innovation and adopter characteristics, the other two models focus on the acceptance and use of ICT innovations by individuals while focusing on their attitude towards (the use of) an innovation. Despite these differences, these models have an important similarity: they only pay limited attention to the influence of the environment of an organization on its innovation adoption decision [13].

Pollitt [13] states that a distinction can be made between two theoretical approaches of innovation diffusion: a functional approach and a constructivist (or cultural) approach. According to the functionalist approach – which is dominant in the models discussed above – adoption decisions are (primarily) driven by functional imperatives of efficiency. An organization's adoption decision is primarily based on a "logic of consequence": the assumption that organizations make choices among alternatives by evaluating their consequences in terms of prior preferences [10, p. vii].

On the contrary, according to the constructivist (or cultural) approach, adoption decisions are not so much based on 'economical fitness', but on 'social fitness' or considerations of legitimacy, symbolism and fashion. An organization's adoption decision is primarily based on a "logic of appropriateness": organizations have identities and/or fulfil roles by recognizing situations and following rules which match appropriate behaviour to the situations they encounter [10, p. viii].

However, in order to fully understand diffusion processes in the public sector, it is important to combine the two approaches [11, 13, 19]. Whereas the functionalist approach demonstrates the importance of innovation and adopter characteristics, the constructivist or cultural approach puts adoption in a broader perspective and emphasizes reasons for adoption which are much more related to the environment. This environment is seen as a reservoir of different meanings, which are being shared – to some degree – by the organizations that are being a part of a specific policy sector [18]. From a cultural perspective, a policy sector refers to the existence of a community of organizations that partakes of common meaning systems and those participants interact more frequently and faithfully with one another than with actors outside the policy field [17, p. 56]. The way in which organizations embrace these meanings influences the way in which an organization is being perceived as legitimate. In the end, this also influences the adoption of innovations that are being viewed as the expression of specific patterns of meaning [11].

3 Towards a Conceptual Framework

Based on the insights from the theories discussed above, this section presents a conceptual framework for the diffusion and adoption of e-government innovations in the public sector that integrates a functionalist and a constructivist (or cultural) approach.

3.1 Goodness of Fit

At the heart of e-government innovation diffusion processes in the public sector lies the exchange of innovation information and experience among the organizations in a network [16, p. 233]. In this complex and non-linear process of communication and learning, organizations reduce uncertainty about an innovation. They create and share information about the innovation with one another in order to reach a (mutual) understanding about the (different) meanings of the innovation [16, p. 5]. In other words, this communication and learning process can be understood as an (iterative) process of sense-making, in which organizations express, test and re-frame their perceptions about an innovation in order to reduce the ambiguity and equivocality regarding the possible meanings of the innovation [21]. This process of sense making is focused on the creation of a match between an innovation and a potential adopter, a so-called “goodness of fit” [4, 11]. As indicated above, this fit can be understood both in terms of the “logic of consequence” and the “logic of appropriateness”. The following three types of meanings of the goodness of fit can be distinguished.

3.2 Functional Meaning

The functional meaning of an e-government innovation is (primarily) based on the logic of consequence and refers to the importance of the (perceived) characteristics of an innovation [3, 7, 16]. A distinction can be made between six – empirically interrelated but conceptually distinct – characteristics [16, p. 16-17]: relative advantage (degree to which an innovation is perceived as better than the idea it supersedes - in economic terms, but also in terms of social prestige), compatibility (degree to which an innovation is perceived as being consistent with existing values, norms, needs and past experiences), complexity (degree to which an innovation is perceived as difficult to understand and use), trialability (degree to which an innovation may be experimented with on a limited basis), observability (degree to which the results of an innovation are visible to others) and reinvention (degree to which an innovation can be changed or modified by a user in the process of adoption and implementation).

3.3 Political Meaning

The political meaning of an e-government innovation is (primarily) based on the logic of appropriateness and refers to the opportunity structure an innovation can provide. In the public sector, competing problem definitions, approaches and solutions (incremental and innovative ones) are constantly trying to get the attention of political and other stakeholders. For innovations to be adopted, (elements of) these streams of actors, problems and solutions have to be coupled. In other words, a so-called ‘window of opportunity’ has to be created. The opening of a window can be triggered by a change in one of the streams (e.g. a change in the perception of a problem or a possible solution), by a focusing event that draws attention to a problem (like elections or public pressure), or by so-called policy entrepreneurs or change agents that ‘soften-up’ policy communities to gain acceptability for an innovation [9].

3.4 Institutional Meaning

The institutional meaning of an e-government innovation is (primarily) based on the logic of appropriateness and refers to the notion of “isomorphism”. Isomorphism is “a constraining process, that forces one unit in a population to resemble other units that face the same set of environmental conditions” [4, p. 66]. As more and more organizations adopt an innovation – either through coercion or imitation – the innovation becomes a legitimate mode of operation. A distinction can be made between three types of isomorphism [4]. Coercive isomorphism refers to formal power (like legislation) and informal power (like peer group pressure), which is used to adopt specific changes. Mimetic isomorphism results when an organization copies an (often successful) example. Normative isomorphism occurs when an organization adopts an innovation because the professional and scientific community of which the organization is a member advocates the innovation.

4 Enablers and Barriers

Next, three categories of factors and mechanisms are discussed that can explain the diffusion and adoption – and the goodness of fit – of an e-government innovation.

4.1 Diffusion Policy

A first category of factors and mechanisms that explains the adoption of an e-government innovation refers to the diffusion policy. In the diffusion literature, this category is rather underexposed. However, inventors, (early) adopters and intermediary organizations – such as ministries, knowledge centres and commercial organizations – can play an important role in spreading an innovation. As Downe et al. [6, p. 551] state, “the transfer of knowledge and the creation of innovation depends on the capacity and expertise of both the recipient organization and the originating organization”.

The diffusion of an innovation is influenced by the degree to which the inventor, (early) adopters and/or intermediary organizations are willing (in terms of attitude) and able (in terms of resources) to share their knowledge and experience on the innovation. This willingness and ability to share knowledge and experience has to be translated into a diffusion- and codification strategy in which explicit dissemination activities are formulated [6, 14]. This strategy should be both focused on the codification of gained experiences and distribution of knowledge and experience – for example by making brochures, protocols and project plans available – and on the creation of a mutual process of communication and learning – for example by offering potential adopters the possibility to exchange information and experiences with adopters at a conference or by organizing site visits. The use of ambassadors – individuals or organizations that actively promote the adoption of an innovation – can also be part of a diffusion strategy.

Finally, the diffusion and adoption of an innovation is influenced by the attention the media pays to an innovation [9, 16], for example because an innovation has won an award.

4.2 Organizational Characteristics of Adopters

A second category of factors and mechanisms that explains the adoption of an e-government innovation refers to the structural and cultural characteristics of (potential) adopters [8, 16, 17]. First, the adoption of an innovation is influenced by the organizational size. For larger organizations it is relatively easier to mobilize resources – like time, people and money – for the adoption and implementation of an innovation.

Next, the adoption decision of an organization is influenced by its formal structure – e.g. its degree of centralization, functional differentiation and specialization – and its innovation preparedness, which refers to its receptivity to change, in which trial and error can take place. According to Burns & Stalker [2], organic organizations are more willing and able to adopt an innovation than mechanistic organizations, because the formal and rigid structure and culture of the latter hinder change and frustrate the possibility of trial and error.

Finally, the adoption of an innovation is influenced by the degree to which policy entrepreneurs [9] or champions [16] – charismatic individuals who throw their weight behind an innovation in order to overcome indifference or resistance that the new idea may evoke – are present in an organization and are able to create or open a policy window for the innovation.

4.3 Network Characteristics

A final category of factors and mechanisms that explains the spread of an e-government innovation refers to the network characteristics [8, 16, 17]. Network characteristics influence the exchange of knowledge and experience among the organizations participating in a network as well as the adoption decisions of these organizations.

The willingness and ability to exchange innovation information and experience among the members of a network is influenced by the quality – e.g. the degree of mutual trust or competition - and intensity of their relations. Moreover, this exchange of knowledge and experience is facilitated by geographical [1] and cultural proximity [16]. This geographical and cultural proximity also influences the adoption of an innovation. Organizations tend to copy innovations from their neighbours [1] and from organizations that share the same frame of reference [16]. However, a shared frame of reference or ideology can also hinder the adoption of an innovation, since cultural closeness can lead to the reproduction of the existing ‘modus operandi’ [16, 17].

Finally, the degree of interdependency between organizations can serve as an incentive to adopt an innovation, because interdependency can make an organization feel “forced” to adopt an innovation [4].

5 Research Strategy

In order to gain insight in the diffusion process of SMS-alert among Dutch police forces, an in-depth case study was conducted. By using this case study strategy, the holistic and meaningful characteristics of the case could be retained and patterns of meanings, based on the interactions among relevant actors, could be reconstructed [22].

The selection of the case was based on two criteria. First, as argued above, following the logic of appropriateness, the adoption of e-government innovations by public sector organizations is strongly influenced by (developments in) their environment [11]. Therefore, a case was selected from a policy sector that is currently highly politicized: safety. Hence, we expect that not only the logic of consequence but also the logic of appropriateness would play a role in the decision to adopt an innovation. Second, mainly due to extensive media attention, SMS-alert is an innovation that is rather widely known in the Netherlands. Also, the system has won one innovation award and was nominated for a second award. This raised the question whether this familiarity with (the success of) SMS-alert had led to the wide adoption of the innovation.

The qualitative data for the case study are triangulated [22] and come from the study of relevant policy documentation, websites and in-depth interviews. Using a semi-structured schedule, ten different stakeholders were interviewed, working at different police forces and at different levels. First, the policeman who invented SMS-alert, the project manager of Midden- and West-Brabant who was set the task to spread SMS-alert, and his contact at the technology supplier of SMS-alert. Next, the project managers of four police forces that adopted SMS-alert, one police force that initially decided to reject the innovation (active rejecter) but eventually did adopt SMS-alert, and two police forces that not (yet) really considered the use of SMS-alert (passive rejecters or non-adopters) [16, p. 178]. Although the importance of adoption of SMS-alert by individual officials is acknowledged, this research focused on the organizational adoption decision of police forces.

The data are collected from March 2006 until March 2007. Based on these data, the diffusion and adoption process of SMS-alert among Dutch police forces was reconstructed and the factors and mechanisms explaining these processes were identified.

6 Findings

This section presents the findings from the case study. By discussing the diffusion policy, the different meanings of the innovation, the organizational characteristics of adopters and the network characteristics, the factors and mechanisms that explain the process of diffusion and adoption of SMS-alert are identified.

6.1 Diffusion Policy

A first category of factors and mechanisms that explains the diffusion process of SMS-alert concerns the diffusion policy. This category refers to the attitude and resources of inventors, (early) adopters and intermediary organizations towards knowledge sharing and its translation into a diffusion- and codification strategy.

First, the police force of Midden- and West-Brabant – was very willing and able to share its knowledge about SMS-alert. After the invention of the system by a policeman, in November 2005 a project manager (ambassador) was appointed who was explicitly set the task to diffuse SMS-alert to other police forces. This project manager developed – partially by means of grants of the Ministry of Internal Affairs

and the province of Noord-Brabant – an active diffusion strategy. This strategy was not only focused on the distribution of (codified) knowledge and experience by making the project plan, a brochure, protocols and an instruction movie available. By giving presentations to interested police forces and offering advice on the start of a pilot, the project manager also created a mutual process of communication and learning. For example, one of the police forces that initially rejected the innovation because it had recently developed its own system eventually decided to adopt SMS-alert, because the project manager had shown how to combine the two innovations.

However, in September 2006 both the project manager and the diffusion of SMS-alert were transferred to VTS Netherlands, an organization which is set the task to uniform the information systems of Dutch police forces. Although VTS Netherlands is interested in SMS-alert, due to limited resources, the organization has not prioritized the encouragement of the nationwide introduction of SMS-alert. Therefore, at this moment, the project manager is advocating the diffusion of SMS-alert on his own initiative (in his leisure time), for example by introducing a (structural) national SMS-alert meeting.

Technology suppliers often play an important role in the diffusion of technology driven innovations like SMS-alert, because they have a commercial interest in spreading the innovation. However, in this case, the role of technology supplier Emexus in spreading SMS-alert was very limited, due to strict agreements with the police force of Midden- and West-Brabant.

Finally, the extensive (local, regional, national and international) media attention for SMS-alert made the innovation widely known and stimulated its diffusion. This media attention was generated by the fact that SMS-alert successfully contributed to public safety. Also, SMS-alert won one innovation award, and was nominated for a second award.

6.2 Functional Meaning

The functional meaning of an innovation is based on the logic of consequence and refers to the influence of the (perceived) characteristics of an innovation on its adoption. First, the *relative advantage* of SMS-alert strongly influenced its adoption. The adopters of SMS-alert state that the evaluation of the pilot in Midden- and West-Brabant clearly showed the (perceived) advantages of the innovation for both the police force and its citizens. For example, several missing children and a stolen scooter had been found thanks to SMS-alert. As discussed above, these successes were also made *visible* by the project manager and by the media. Moreover, these advantages were combined with (relatively) low initial expense and (relatively) low *costs* for using the system.

However, the relative advantage of the innovation also influenced the decisions of the (passive) rejecters. Several police forces are participating in the pilot of an innovation highly comparable to SMS-alert, called Burgernet. Other police forces are themselves currently developing a system comparable to SMS-alert. As a result, for these police forces, at this moment, the advantages of SMS-alert are not high enough. In other words, the diffusion of SMS-alert was hindered by the competition with innovations – especially Burgernet - that are comparable to SMS-alert, also in terms of their advantages.

Second, the adoption of the innovation was not handicapped by its *complexity* or its *compatibility*. Because its introduction requires adapting existing systems and rethinking the distribution of responsibilities among officials, the adoption of SMS-alert can be regarded as rather complex. However, especially for late(r) adopters, this complexity was reduced by the diffusion strategy of the inventor that made (codified) knowledge and experience on the introduction and use of SMS-alert available to (potential) adopters. As a result, for late(r) adopters it was quite clear what kind of organizational changes had to be taken into account.

Third, this case shows the importance of *trialability* of an innovation. It demonstrates that test results reduce uncertainty about (advantages of) an innovation. Many police forces – especially the smaller ones – waited for the results of the pilot in Midden- and West-Brabant before they decided on adopting SMS-alert. Moreover, the adopters also wanted to test the system themselves, before introducing it in every district of their police forces. Therefore, almost every adopter introduced SMS-alert in phases (per district). Finally, the importance of test results is demonstrated by the fact that several police forces decided to adopt SMS-alert instead of Burgernet, because SMS-alert, as opposed to Burgernet, is a proven technology.

Finally, the degree to which SMS-alert can be modified to the specific needs and characteristics of individual police forces did not handicap its adoption. Because police forces are free to decide which functions they ascribe to SMS-alert, several examples of *reinvention* can be found in this case. However, this possibility for reinvention is limited by the fact that every adopter has to sign a contract with the police force of Midden- and West-Brabant in which agreements are made about product changes and the acknowledgement of intellectual property.

6.3 Political Meaning

The political meaning of an innovation is based on the logic of appropriateness and refers to the opportunity structure an innovation can provide. In this case, the political meaning of the innovation was very important. On the one hand, due to a number of political and societal developments, a *policy window* was created for SMS-alert at many police forces, which generated support and finances for the innovation. The improvement of safety and citizen satisfaction – as indicated by the Cabinets program “Towards a safer society” and the report “Active reciprocity” of the Ministry of Internal Affairs – are goals that are high on the political and societal agenda. For Dutch police forces, these ambitions are reflected in the realization of the so-called “National Plan Dutch Police 2003-2006” and the “Regional Covenants Police”. In these plans performance agreements are laid down between the police forces and the Ministers of Internal Affairs and Justice. By adopting SMS-alert, police forces could show that they contributed to the goals of improving safety and citizen satisfaction and increase their performance and legitimacy.

On the other hand, the policy window for SMS-alert was limited, because the system had to compete for support and resources with highly comparable innovations, primarily Burgernet. Several police forces did not adopt SMS-alert (yet), because they participated in a Burgernet pilot. Other police forces decided to wait for the test

results of this Burgernet pilot before investing their (limited) resources. At the national level, SMS-alert also had to compete with Burgernet for support and resources. Recently, in its coalition agreement, the Cabinet announced the nationwide introduction of Burgernet. Moreover, the Board of Commissioners is advocating the integration of SMS-alert and Burgernet by considering SMS-alert as the text message application of Burgernet.

At some police forces, *policy entrepreneurs* facilitated the opening of a policy window for SMS-alert. An example of these policy entrepreneurs is the so-called innovation brokers of one of the police forces. These innovation brokers are explicitly set the task to identify interesting ideas and innovations – such as SMS-alert – inside and outside their own police force. By identifying these innovations and advocating them at their own police force they created a policy window for these innovations. Also, at the implementation of SMS-alert, many project managers served as entrepreneurs, because they educated their officials in using the innovation.

6.4 Institutional Meaning

The institutional meaning of an innovation is based on the logic of appropriateness and refers to the notion of isomorphism. For the diffusion of SMS-alert, *mimetic isomorphism* has been very important. As indicated, the evaluation of the pilot in Midden- and West-Brabant showed the (perceived) advantages of the innovation. Stimulated by the political and societal developments described above, other police forces wanted to mimic this success. Moreover, this mimicking was facilitated by the availability of (codified) knowledge and experience about the innovation.

Next, this mimetic isomorphism was stimulated by some coercive and normative isomorphism. *Coercive isomorphism* resulted from the fact that the Ministry of Internal Affairs – linked to a subsidy for the development of SMS-alert by the police force of Midden- and West-Brabant – insisted on regarding SMS-alert as a national example. Hence, soft political pressure was generated which should stimulate police forces to adopt SMS-alert. Also, SMS-alert won one innovation award and was nominated for a second award. Some *normative isomorphism* resulted from the large number of professional networks in which experiences with SMS-alert were discussed and relevant knowledge was exchanged.

As demonstrated, at this moment, coercive and normative isomorphism seem to play a minor role in the diffusion of SMS-alert in comparison to the instrumental and political meaning of SMS-alert. Although the compulsory legitimacy of SMS-alert is growing, police forces still feel free to make their own decision with regard to the adoption of SMS-alert. For now, due to political pressure, coercive isomorphism especially seems to hold for the adoption of Burgernet. However, SMS-alert is still a relatively new innovation and its diffusion process is not crystallized. Several police forces have not yet decided about the adoption (or rejection) of SMS-alert. Consequently, the importance of coercive and normative isomorphism – and of the institutional meaning of SMS-alert – may change over time, while its effects will become more dominant when Burgernet and the insertion of SMS-Alert as a part of Burgernet, will be nationwide implemented.

6.5 Organizational Characteristics of Adopters

The adoption of an innovation is also influenced by the organizational characteristics of (potential) adopters, such as their size, formal structure and innovation preparedness. First, the *size* of the police forces influenced the ability to free time, people and finances for the adoption and implementation of SMS-alert. Many early adopters are larger police forces for who it was (relatively) easy to free the resources necessary for a pilot. However, several smaller police forces are still trying to arrange the resources – especially time and people – that are required for the adoption and implementation of SMS-alert. Other (often smaller) police forces decided to await the developments concerning the nationwide introduction of Burgernet before investing their (limited) resources. Finally, at several police forces the adoption (and implementation) of SMS-alert was endangered by the high turnover of project managers, sometimes because being a project manager only was a temporary job.

Secondly, the *formal structure* refers to the layered construction of police forces. Many officials are involved in the adoption – and especially the implementation – of SMS-alert. In order to make full use of the system, these different officials have to be willing and able to use it. Therefore, an important role was given to the SMS-alert project managers in educating their officials.

Finally, the *innovation preparedness* of the police forces influenced their adoption decisions. Although examples of (institutionalized) innovation can be found at Dutch police forces – such as the innovation brokers discussed above or the innovation workgroups and departments that are part of many police forces – innovation is not entirely anchored, especially at the national level. Recently, the (unofficial) Board Research and Innovation stated that the national Board of Chief Commissioners has no clear vision on how to deal with innovations. Moreover, both the board and individual police forces argue for a more structural and less fragmented exchange of innovative ideas among as well as inside police forces.

6.6 Network Characteristics

A final category of factors and mechanisms that influences the diffusion and adoption of innovations refers to the network characteristics. On the one hand, the network in which SMS-alert diffuses can be characterized as *well organized*. Different types of officials regularly meet – both formally and informally. Sometimes these meetings are linked to *geographical proximity*. On the other hand, as stated above, the exchange of innovative ideas among police forces is often fragmented. In the case of SMS-alert, knowledge and experience are rather structurally exchanged among adopters. Next to many informal meetings, the project managers meet at the recently introduced national SMS-alert meeting. Also, some project managers exchange knowledge and experience with project managers of comparable innovations, like Burgernet. However, the exchange of information with police forces that have not (yet) adopted SMS-alert is limited to informal meetings and more general meetings, like the Board of Chief Commissioners.

Moreover, the exchange of knowledge and experience about SMS-alert among police forces is facilitated by their cultural proximity. Partly due to political and societal

developments, police forces share the same frame of reference: they want to improve their performance and legitimacy by improving safety and citizen involvement.

Finally, by intensively exchanging knowledge and experience, police forces can try to influence each other's adoption decisions. However, because police forces operate rather *independently*, they cannot determine each other's adoption decisions.

7 Goodness of Fit

This article examined the diffusion and adoption of an e-government innovation – called SMS-alert – among Dutch police forces. Based on both a functional and a constructivist (or cultural) approach, a conceptual framework for the diffusion and adoption of e-government innovations in the public sector was developed. By using data from documentation, websites and interviews, the process of diffusion and adoption of SMS-alert was reconstructed and the factors and mechanisms explaining this process were identified. This final section presents the conclusions about the realization of the “goodness of fit” in this case and the factors and mechanisms contributing to this.

At this moment, SMS-alert can be regarded as an innovation that has diffused rather rapidly among Dutch police forces: out of a total of twenty-six, nine police forces have adopted SMS-alert and at least seven police forces are considering adoption. This rapid diffusion was strongly stimulated by the active diffusion strategy of the project manager of Midden- and West-Brabant. He enabled adopters, potential adopters and rejecters to exchange their knowledge and experience and to express, test and re-frame their perceptions about SMS-alert. Therefore, this case confirmed the importance of a diffusion policy for the diffusion of an innovation.

In this process of communication and learning two dominant meanings of the innovation – and the goodness of fit – can be distinguished. First, the functional meaning of the innovation – especially its (visible) advantages, the existence of competing innovations and the availability of test results – was very important in this case. Secondly, as a result of the fact that safety and citizen involvement were high on the political and societal agenda, the political meaning of SMS-alert also contributed to its diffusion. Finally, the institutional meaning of the innovation was not so strong in this case in comparison to the instrumental and political meaning of the innovation. Although some traces of coercive, mimetic and normative isomorphism and a growing legitimacy of SMS-alert were found, police forces are not (yet) forced to adopt SMS-alert in order to preserve their effectiveness and guarantee their legitimacy. However, we expect that the institutional meaning of the innovation will increase. Recently, both the Cabinet and the Board of Commissioners have announced the nationwide introduction of Burgernet and SMS-alert being the text message application of Burgernet. As a result, the policy windows at police forces that have not yet adopted SMS-alert seem to be declining. They will be forced to adopt both systems.

In short, the case confirmed the value of combining a functional and a constructivist approach in examining the diffusion and adoption of e-government innovations in the public sector. It demonstrates that for the explanation of innovation diffusion processes in the public sector, both the logic of consequence and the logic of appropriateness are important.

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The Digital Divide Metaphor: Understanding Paths to IT Literacy

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Abstract. Not having access or having a disadvantaged access to information, in an information-based society may be considered as a handicap [5]. In the last two decades scholars have gradually refined the conceptualization of digital divide, moving from a dichotomous model mainly based on access to a multidimensional model accounting for differences in usage levels and perspectives. While models became more complex, research continued to mainly focus on deepening the understanding of demographic and socioeconomic differences between adopters and non-adopters. In doing so, the process of basic IT skills acquisition has been largely overlooked. This paper presents a metaphorical interpretation of the process of IT skills acquisition derived from empirical evidence. The analysis highlights the presence of three distinct IT skills acquisition approaches, as well as the key role of self-learning. These preliminary results represent a useful starting point for the design of more effective and sophisticated inclusion policies.

Keywords: Digital Divide, e-Skills, e-Policies, e-Inclusion.

1 Introduction

In his recent best seller “The World Is Flat” The *New York Times* columnist Thomas Friedman argued that in the year 2000 the world entered a new era of globalization. According to this author, the previous globalization phases were spearheaded by countries and companies going global, the latest phase, instead, is and will be built around individuals globalizing. This view of the world, by stressing the key role played by individuals as dynamic agents in information-based economies, adds an interesting perspective to the framing of digital divide.

This perspective shifts the “public policy problem” of the digital divide from a matter of pure social inequality to a strategic issue in a global race for competitiveness. At present, the different globalization patterns individuals may pursue are still vague and surely require further investigation. Nevertheless, it seems reasonable that worldwide access to people and information/knowledge may be considered two key ingredients to globalization processes. From a policy standpoint, the stress put in the *i2010 European*

Strategic Plan on the importance of a single information space for the creation of an inclusive information society seems to support this thesis. In this view, the use of information and communications technologies (ICT) is seen to underpin the social and economic progression of nation-states throughout the first stages of the twenty-first century [24]. The ability to use ICT and work with information may therefore be defined as “the indispensable grammar of modern life” and a fundamental aspect of citizenship in the prevailing information age [30].

The aim of this paper is to investigate how people learn to use the “grammar of modern life” in order to provide policy makers with new and more refined information for the creation of effective and sophisticated inclusion policies. Warschauer [29, p.47] argues, “Access to ICT for the promotion of social inclusion cannot rest on providing devices or conduits alone. Rather, it must engage a range of resources, all developed and promoted with an eye toward enhancing the social, economic, and political power of the targeted clients and communities.”

The article is structured in six sections including these introductory comments. The second section briefly reviews the literature on digital divide and IT skills, highlighting its scholarship evolution as well as areas that need further investigation. Section three presents the research design and methods used in this paper. Section four provides evidence of the importance of IT skills for Internet access and use and presents a preliminary foundation for the classification of Internet users (including non-users). The fifth section lays out a digital divide metaphor and argues its usefulness on the basis of the empirical evidence presented in this paper. The last section includes some concluding remarks and a discussion of important policy implications.

2 Digital Divide and IT Skills

The digital divide is often characterized as inequality in the relationship between groups of individuals and their relationship with information communication technologies (ICTs). The reason for the inequity is still debated. However, differences in people’s online skills are a major factor in understanding the digital divide [6]. The term, IT skills, is a varied concept. Skill definitions range from describing information-retrieval and searching activities to skills regarding the synthesis of information and productive use of information in daily activities. An extensive information literacy literature review was done by Virkus in 2003 and the following comments on IT skills draws heavily from that research.

The following section outlines the viewpoints and assumptions taken by different authors in both the digital divide literature and the IT skills literature. While scholars investigate many different types of technology, connectivity and uses, the last fifteen years of digital divide research yielded three main approaches to understanding the phenomenon, they include the access divide, multi-dimensional digital divide, and multi-perspective digital divide. Information technology skills and information literacy research also focused on two main approaches [26]. The most common was identifying discrete skills and attitudes that can be learned by individuals and measured [12], [13]. The other focus was more of a behavioral-constructivist

approach, which emphasized how an individual experiences and makes sense of his/her world in an information society[2].

2.1 The Digital Divide and IT Skills as a Simple Dichotomous Phenomenon

One view of the digital divide is as a clean separation between those who have access to technology and those who do not. The issue is framed as an ‘access to technology problem’ and as an inherent delay in the diffusion of technology among different geographic areas and social groups [1], [5]. One assumption is that “once online, there is no gap” and it is assumed everyone uses the Internet for the same purposes [27, p. 281]. Based on these assumptions, access to the Internet and use of the Internet are often equated in empirical studies [6]. From this view, the only important determinant of Internet use is access. IT skills are rarely mentioned and their effects are commonly not tested. Scholars see the access divide closing on its own, through market forces and do not advocate for public policy intervention [5].

While the early research from the access divide viewpoint neglects the importance of IT skills, a review of the IT skills literature reveals there was a spirited debate about information literacy and IT skills in progress as early as the late 1980s. Virkus [26] reviewed the literature and reported that [9] identified two distinct viewpoints, one that sought greater precision in the terminology of IT skills and the other warned against precision. In addition, Virkus [26] reports that “Hopkins [15] found that there was an unresolved dichotomy and confusion between the notion of information skills as (a) the retrieval and location of information, and (b) the analysis and synthesis of information; the distinction between the two is not clearly articulated in the literature.” Similar to the access divide, the early IT skills divide thought of the issues as being simple. However, research continued to progress toward more and more complex ways of understanding the phenomenon.

2.2 The Digital Divide and IT Skills as a Multi-dimensional Phenomenon

Another perspective suggests the digital divide is a multi-dimensional phenomenon [10]. This view believes access to technology is a necessary building block (i.e., almost a “given”), but that once online, different factors influence an individual’s use of technology [25], [19]. DiMaggio and Hargittai [6] take this position suggesting, “As the technology penetrates into every crevice of society, the pressing question will be not ‘who can find a network connection at home, work, or in a library or community center from which to log on?’ but instead, What are people doing, and what are they able to do, when they go on-line?” More recently, Ferro *et al* [19] added a dimension to this picture by highlighting the presence and the interrelation of demand and supply related divides. Scholars suggest public policy intervention is needed to close gaps in information literacy, employment opportunities, or community redevelopment [4], [17]. Warschauer [29] argues that there are many similarities between literacy and ICT access, which need to be more closely examined.

Virkus [26] chronicled the evolution IT skills literature and demonstrated authors have challenged the simple idea that IT Skills are unidimensional. The following highlights the multi-dimensional characteristics of IT skills development. For example, Mutch [18] argues that the term needs to be expanded, he writes “the term

'information literacy' carries overtones of a very tightly defined skill set or competence rather than the broader and more complex set of attitudes, approaches and skill sets...". In addition, Mutch writes that an Organization for Economic Cooperation and Development (OECD) report emphasized the following, "The ability to seek and exchange information using databases and networks is not simply dependent on access to technology, but requires possession of the necessary technical skills. In addition, it calls for basic competence in being able to choose, classify and critically evaluate the information that becomes accessible." [20, p. 102]. Therefore, scholars from the multi-dimensional divide view and a multi-dimensional IT skills view see this phenomenon as intertwined. In this view, IT skills are important and frequently included in digital divide theoretical and statistical models. However, even within this more comprehensive view, IT skills acquisition patterns are rarely explained.

2.3 The Digital Divide and IT Skills as a Multi-perspective Phenomenon

A third viewpoint questions the concept of the digital divide and calls for scholars to re-theorize technology's relationship with race, gender and culture [22], [3], [16], [28]. Scholars suggest it is necessary to understand the different dimensions of the digital divide, as well as to critique the dominant discourse on how and why the different dimensions affect inequality. Hines et al. [14, p. 5] writes "individuals and communities employ technologies for very specific goals, linked often to their histories and social locations..." therefore, "barriers to access [and use] operate on many levels and therefore solutions must take multiple approaches". A multi-perspective viewpoint emphasizes that the experiences of those who are marginalized in society and should be the starting point for discussions on the digital divide [22], [25]. Public intervention is needed and policies should be tailored to the specific needs of various perspectives (or experiences of marginalized groups). Warschauer [29, p. 221] states, "Once social problems or goals are identified, programs should be based on a systemic approach that recognizes the primacy of social structure and promotes the capacity of individuals or organizations for ongoing social change through innovation of those structures using technology".

The level and acquisition patterns of IT skills could be seen as one of these important perspectives. How do marginalized groups acquire IT skills? IT skills and literacy researchers suggest the idea of IT skills literacy is complex. Scholars believe that IT skills can be seen as a multi-perspective viewpoint also. For example, Waschauer [29, p. 46] writes, (1) literacy is not just one type of literacy, but many, (2) the meaning and value varies in particular social contexts, (3) literacy capabilities exist in gradations and not as a dichotomy of literate versus illiterate, (4) literacy alone does not guarantee an automatic benefit outside of its particular function, (5) literacy is a social practice involving artifacts, content, skills, and social support, (6) acquisition of literacy is not only about education but also power.

Heretofore, some scholars have studied the importance of IT skills for Internet access and Internet use, but little or no provision has been made for the process of basic IT skills acquisition. We believe that the understanding of this process is key for the design of effective inclusion policies. That is why the analysis will be aimed not only at testing the importance of IT skills for Internet access and use, but also at casting some light on the different patterns of IT skills acquisition.

3 Methodology

The empirical analysis presented in this paper is based on a survey to 2206 Italians who live in the region of Piedmont. The sample used for the purpose of this paper was created from a database provided by the Italian National Statistical Institute (ISTAT) whose data refer to the last periodical census carried out in 2001. The entire data set was collected via Computer Aided Telephone Interviews (CATI) by the ICT Observatory of the Piedmont's Regional Government in November 2005. Thus, people without a fixed line are not represented in the sample. The stratified sample was created using a differentiated probability approach in order to over-represent segments with a higher variance in terms of technology adoption and usage (i.e., young *versus* older people). The variables adopted for the stratification of the sample were: age, gender, and size of town of residence. Following the guidelines provided by the European Statistical Institute, people less than 16 years old were excluded from the sample. Respondents were asked questions about computer ownership, Internet access and Internet use. Relevant individual demographics and household characteristics were also collected. The main analytical tools used for the analysis and interpretation of data are multiple linear regression models, hierarchical cluster analysis and cross tabulations.

The article will also take advantage of a metaphor as a literary tool for the production of a clear, simple and synthetic representation of an articulated and complex problem. The final objective of the exercise is twofold. First, it provides an easy and concise communication of the complexity inherent in the analysis. Second, it proposes a simplified but faithful representation of reality to be used as a test bed for conceptual speculations and practical discussions about possible inclusion policies.

4 Analysis and Discussion

The next sub-sections have two main purposes. The first applies two of the three approaches presented in the digital divide literature review section to the phenomenon of Internet access and Internet use: (1) access divide model and (2) multi-dimensional divide model. It provides evidence of the importance of some factors as determinants of Internet access, as well as evidence of the importance of Internet access as a determinant of the extent of Internet use. The second section, instead, proposes that Internet users can be classified according to their learning patterns and usage levels. Using this classification we argue that the divide is widening and policy makers should pay attention to this problem, particularly IT skills acquisition. Together these two subsections highlight the importance of Internet access and Internet use and suggest some areas for future exploration.

4.1 Internet Access, Internet Use, and IT Skills

Using regression analysis, this section provides empirical evidence on the importance of IT skills on Internet access and Internet use. Table 1 presents the results of an access divide model and a multi-dimensional divide model using the number of devices for Internet access as the dependent variable. Income is positively associated

with Internet access, which is not surprising, since people need money to buy the necessary devices to access the Internet.

Table 1. Determinants of Internet Access (Number of Devices)

Independent Variables	Access Divide Model	Multi-Dimensional Divide Model
Constant	-0.343** (-2.232)	-0.217 (-1.537)
Income	<0.001*** (7.675)	<0.001*** (3.813)
Age	-0.009*** (-10.483)	0.002* (1.776)
Education	0.174*** (8.139)	0.033* (1.700)
Attitude towards Computers	0.093*** (9.705)	0.038*** (4.450)
Nationality (Italian = 1)	0.164 (1.603)	0.028 (0.319)
Location (Town = 1)	0.079 (1.290)	0.031 (0.593)
Location (Village = 1)	0.049 (0.803)	0.013 (0.240)
Gender (Female = 1)	-0.109*** (-3.860)	-0.047* (-1.916)
Other Language (English)		0.120*** (3.966)
PC at Home		0.105*** (3.191)
PC Use		0.630*** (16.756)
IT Skills		0.083*** (2.685)
Household Size		0.003 (0.235)
Occupation (Employee = 1)		-0.258*** (-4.744)
Occupation (Self Employed = 1)		-0.264*** (-4.070)
Occupation (Unemployed = 1)		-0.231*** (-3.101)
Occupation (Other = 1)		-0.338*** (-5.132)
R-square	0.407	0.580
Adjusted R-square	0.403	0.575
F-statistic	115.712***	108.750***

Note: T-statistics are in parentheses under coefficient values. Those coefficients followed by * are significant at the 10 percent level, those followed by ** are significant at the 5 percent level, and those followed by *** are significant at the 1 percent level.

Table 2. Determinants of Internet Use (Extent of Use)

Independent Variables	Access Divide Model	Access Divide Model (Extended)	Multi-Dimensional Divide Model
Constant	0.376*** (6.545)	-0.824* (-1.650)	-0.229 (-0.434)
Internet Access	2.929*** (35.882)	1.842*** (16.408)	1.347*** (7.183)
Income		<0.001*** (2.881)	<0.001 (1.555)
Age		-0.023*** (-7.644)	-0.013*** (-3.194)
Education		0.550*** (7.801)	0.369*** (5.035)
Attitude towards Computers		0.253*** (7.906)	0.221*** (6.999)
Nationality (Italian = 1)		0.276 (0.831)	0.175 (0.543)
Location (Town = 1)		0.050 (0.249)	0.057 (0.294)
Location (Village = 1)		-0.012 (-0.060)	0.031 (0.162)
Gender (Female = 1)		-0.554*** (-5.980)	-0.449*** (-4.926)
Other Language (English)			0.539*** (4.785)
PC at Home			-0.271* (-1.659)
IT Skills			0.238** (2.059)
Household Size			-0.060 (1.354)
Occupation (Employee = 1)			-0.256 (1.254)
Occupation (Self Employed = 1)			-0.391 (1.603)
Occupation (Unemployed = 1)			-0.440 (1.579)
Occupation (Other = 1)			-0.667*** (- 2.702)
R-square	0.371	0.532	0.566
Adjusted R-square	0.371	0.528	0.560
F-statistic	1287.531***	168.124***	113.923***

Note: T-statistics are in parentheses under coefficient values. Those coefficients followed by * are significant at the 10 percent level, those followed by ** are significant at the 5 percent level, and those followed by *** are significant at the 1 percent level.

Age is significantly associated with Internet access, but in the access divide model the relationship is negative and in the multi-dimensional model it is positive. That is, as a general trend, older people tend to have a smaller number of devices to access the Internet. However, once controlling for PC use, IT skills, household size, and occupation, older people seem to have a greater number of devices. This seems to suggest that once older people accept technology and have the necessary skills, they tend to have more devices to access and use the Internet. This might be because they have the time and money necessary to buy these new devices. In addition, education

and attitude towards computers are positively associated with Internet access. Therefore, people with more formal education and with a positive attitude towards computers and related technologies tend to have more devices to access the Internet. Finally, being female is negatively associated with Internet access measured as the number of devices to access the Internet.

Several variables related to the multi-dimensional divide model were found to be important determinants. Speaking English is positively associated with Internet access. Having a PC at home and individual use of a PC are positively associated with Internet access. Basic IT skills are positively associated with Internet access. Finally, employment status is a significant determinant of Internet access. Overall, there was an improvement in adjusted R-square from 0.403 to 0.575.

Table 2 presents the results of three models using the extent of Internet use as the dependent variable. The extent of use is operationalized as the number of activities an individual performs using the Internet. The first regression model is based purely in the access divide view and therefore considers Internet access as the only relevant factor affecting Internet use directly. The second model includes the factors mentioned in the access divide view, but tests direct relationships from all of them to Internet use. Finally, the third model incorporates additional variables related to the multi-dimensional divide view, including IT skills.

Overall, there is an improvement in adjusted R-square, which went from 0.371 in the access divide model to 0.560 in the multi-dimensional divide model. Internet access is positively associated with Internet use in all specifications. Income is positively associated with Internet use in the extended access divide model, but becomes not statistically significant once controlling for other variables. Age is negatively associated with Internet use. Education and attitude towards computers are positively associated with Internet use. Being female is negatively associated with Internet use.

Similar to Internet access, there were several variables related to the multi-dimensional divide that were significantly associated to Internet use. For example, speaking English was positively associated with Internet use. Having a PC at home was negatively associated with Internet use. Finally, basic IT skills were positively associated with the extent of Internet use.

In summary, it seems clear that basic IT skills are an important determinant of Internet access and Internet use and are positively associated with both. That is, basic IT skills significantly increase the likelihood of greater Internet access and Internet use. Since, not everybody has the same levels of skills, for research and practical purposes, it is important to understand the differences and similarities among Internet users. The following section provides the empirical foundation for a preliminary classification of Internet users (including non-users).

4.2 IT Skills Acquisition and Internet Use

The aim of this section is to set the stage for the digital divide metaphor by providing it with a robust empirical foundation. Hierarchical cluster analysis and cross tabulations were used to shed some light on a number of aspects pertaining Internet usage levels, purpose of use and acquisition of basic IT skills.

Internet Usage Levels. The first cluster analysis was conducted taking into account different types of Internet usage. Interviewees were asked if they used the Internet and what applications they utilized.

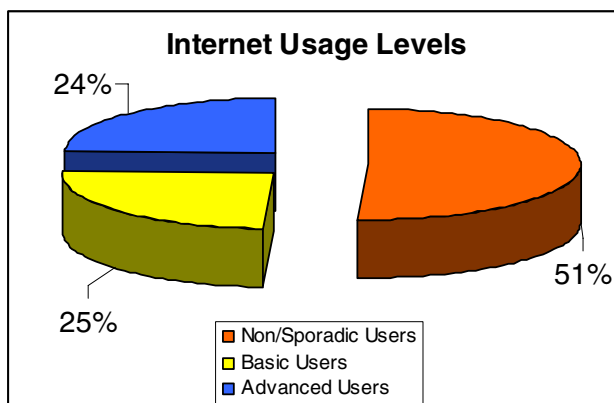


Fig. 1. Basis: All Respondents

The analysis highlighted the presence of three clusters. The first one was labeled as none/sporadic users (51%) since it was characterized 'as a lack of' or 'very limited use' of the Internet. The second group was labeled as basic users (25%) since it showed more regular usage mainly based on information search and email exchange. Finally, the last cluster was defined as advanced users (24%) and was characterized by the use of a much wider range of Internet applications (i.e. videoconferencing, VoIP, e-shopping, blogging and auctions).

These results provide a first indication about the presence of a plurality of approaches towards technology that result in different usage levels. Nevertheless they do not provide any insights as to what the determinants of this difference are. For this reason, a second cluster analysis was conducted to subsequently cross the results of both analyses.

Purpose of Internet Use. The second cluster analysis aims at understanding the purposes driving Internet use. Respondents were asked to list the main purposes for which they used the Internet. In the population considered, two groups could be singled out. A smaller one (about 20% of the population) and a larger one (about 80% of the population). Interestingly enough, the discriminating variable between these two clusters of respondents was the use of Internet for leisure.

Figure 2 shows a breakdown of the main four purposes by cluster. Although the data presented focus on the purpose of use and not on the level of enjoyment generated by the use of technology, it seems reasonable to assert that a portion of the population does not appear to perceive Internet technologies as a potential source of entertainment. In other words, they do not seem to derive pleasure from using these technologies.

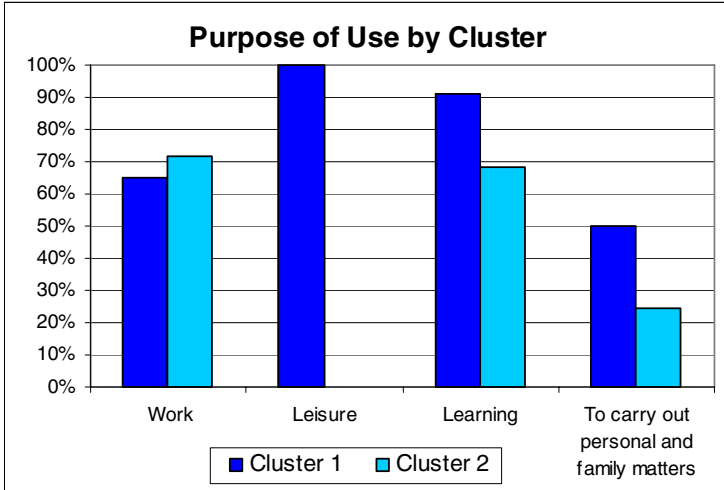


Fig. 2. Basis: Internet Users

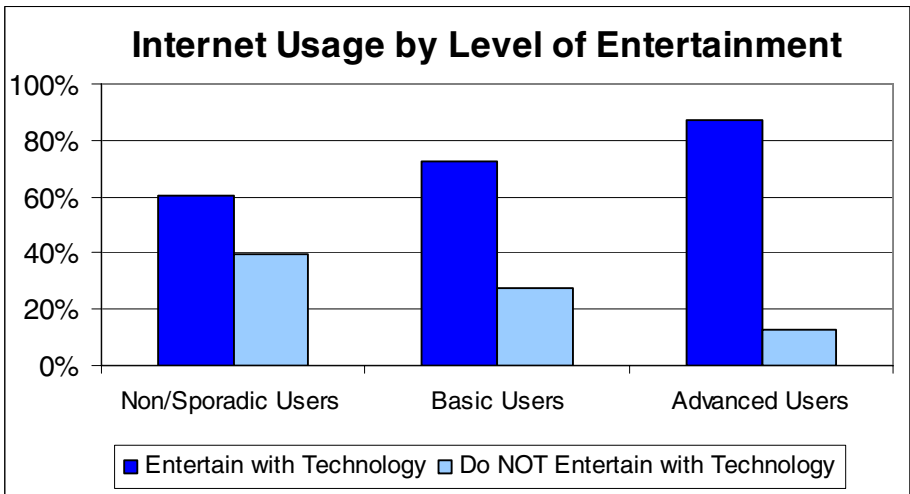


Fig. 3. Basis: Internet Users

By crossing the results obtained from the two cluster analyses conducted so far, some interesting results emerged. Figure 3 shows a clear trend may be identified between sporadic Internet use and lack of pleasure in using technology. This constitutes initial evidence of the presence of different attitudes/approaches to technology leading to different usage level. It goes without saying that from a policy standpoint being able to understand and account for the presence of different approaches to technology represents a key ingredient for the creation of more effective inclusion measures.

Basic IT Skills Acquisition. The final part of the analysis focused on basic IT skills acquisition. In particular, interviewees were asked how they learned to use PCs and the Internet. From the results presented in Figure 4 it is possible to make two main considerations. Firstly, a good portion of IT skills acquisition appears to occur through an informal process of learning by doing. This result is suggested by the important role played by self-learning (present in nearly 60% of respondents). A similar situation may be found at European level. As a matter of fact, the data recently published on Eurostat's website on e-skills show that the percentage of individuals that obtained IT skills through formalized training in educational institutions is as low as 20% [7]. The second consideration regards the fact that basic IT skills are mainly acquired at school or in the workplace.

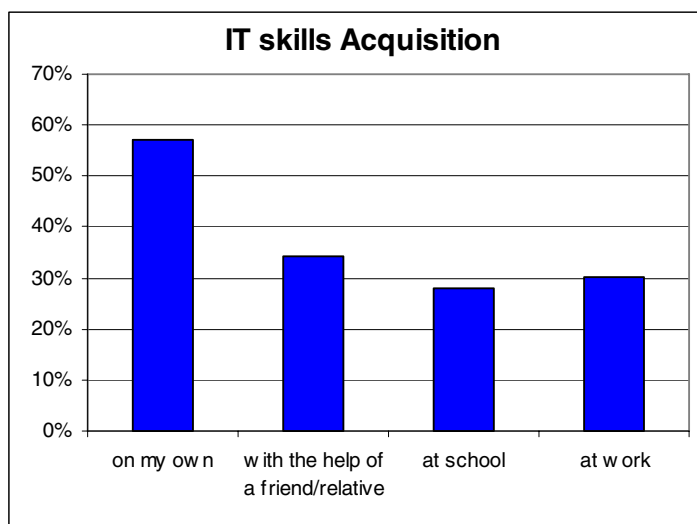


Fig. 4. Basis: All Respondents

By crossing the answers about skills acquisition with the results obtained from the first cluster analysis, self-learning emerged to be a common characteristic to both advanced and basic users. For sporadic users, the presence of self-learning persists but with a significantly lower importance. This suggests that the participation in formal training courses may be considered an appropriate way to overcome the initial inertia mainly for non-users.

The last part of the analysis was aimed at providing some insights as to how the distribution of different Internet users has been changing overtime. For this reason, the first cluster analysis on Internet usage was carried out on a different set of data collected in the previous year.

The comparison of the situation present in 2004 and in 2005 generated an interesting result (See Figure 6). The fivefold difference in the migration rate from

basic users to advanced users and the one from sporadic users to basic users is leading to the creation of a “U” shaped distribution clearly showing the widening of a digital “valley” between advanced and non/sporadic users.

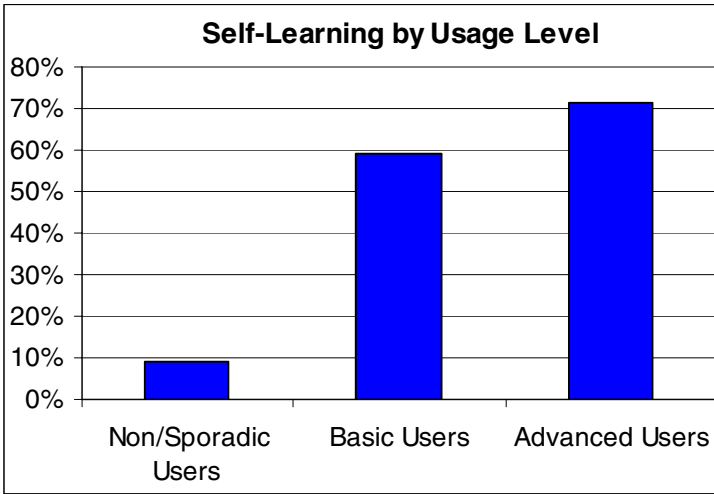


Fig. 5. Basis: All Respondents

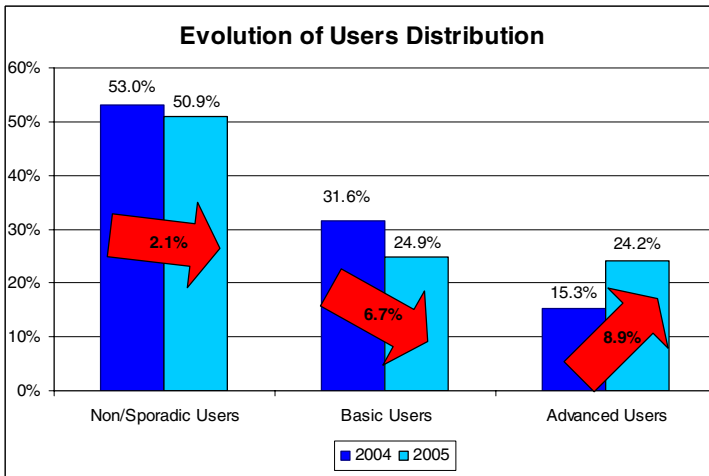


Fig. 6. Basis: All Respondents

These results suggest the need for a careful reflection about the creation of some concrete measures contributing to flatten the shape of the distribution. The use of the digital divide metaphor presented in the next section intends to be a first step in this direction.

5 The Digital Divide Metaphor

From the analysis carried out, the acquisition of basic IT skills emerged as mainly occurring through a process of “self-learning” (learning by doing). A process usually triggered by either an interest in technology or by a constraint/requirement posed by school or at work. For this reason we compared the acquisition of basic IT skills to the act of climbing a set of stairs, in which the first step is considerably higher than the others. Going up and down the stairs is an action that has to be carried out alone and the people that do it may be divided in three groups: (1) athletes, (2) laid back, and (3) needy.

Athletes. They are people that climb stairs mainly because they like exercising and to keep themselves fit. These are technophiles, they are very keen on technology and usually have an innovator or early adopter behavior because of the pleasure and other benefits they extract from using technology. These benefits justify the learning costs that they have to bear to keep their skill set up to date. Athletes extensively use the Internet in both their professional as well as private daily life. To a certain extent, they should not be a concern for policy-makers since they enjoy keeping the pace with technological evolution and change and thus they do not need any kind of external incentive.

Laid Back. This category of people has the physical ability to climb the stairs; nevertheless, individuals are reluctant to do it. In other words, they have the necessary intellectual capacity to acquire IT skills on their own, but do not have sufficient incentives to do it. The reasons at the basis of this inertia may be attributed to a lack of clarity about the benefits they could gain out of it or to the fact that learning costs far exceed the potential perceived benefits. They thus adopt a minimum effort approach that results in a very basic use of the Internet (mainly information search and email exchange). These people in Rogers’ diffusion theory [23] could be classified as “early-late majority”. Their adoption may be accelerated by policy makers through two levers. The first one is an incentive lever, meaning policy makers could explain to these people (through communication campaigns, conferences, etc.) what benefits could be enjoyed by climbing the stairs (i.e.: there is a cake waiting for you at the end of the stairs). The other policy that could be used is a “coercive” measure fostering the wide diffusion of IT requirements in school and in the workplace (i.e., to ask teachers to require more and more the use of PCs from students to carry out their home works).

Needy. These people, regardless of their willingness to climb the stairs, do not have the physical capacity to climb the first step (the highest) and need external help. That is, even when they may be willing to use the Internet in their daily life, they lack the basic IT skills and cultural background to win the initial inertia for starting using it in meaningful ways. What is important to stress is that the external help needed by this group of people will mainly serve to overcome the first step of the staircase. In fact, similarly to the other categories, their learning process is characterized by significant self-learning.

The policy examples in this section are just that, examples. Research needs to be done to determine the possible range of policy levers that can be used to address the

issues associated with different patterns of IT skill acquisition. Further research and investigation will help to flesh out the right mix and balance of policy solutions.

6 Final Comments

The research presented in this article supports that the digital divide is a complex phenomenon transcending simple information access problems. The use of different interpretation models has shown the important role basic IT skills play on both Internet access and use. In particular, different approaches to basic IT skills acquisition emerged and lead to diverse usage levels. In fact, about one fourth of the population considered exhibits advanced user behavior, one fourth is characterized as basic users, while the remaining one half make sporadic use of the Internet or do not use it. Moreover, the analysis carried out over a two-year period depicted the presence of a widening gap in terms of Internet use between none/sporadic users and advanced users. Taking into consideration that Internet use is fundamental for development, national and local policy makers could direct part of their efforts to offset this individual usage polarization. In order to do so, understanding how people approach technology and the different paths leading to the acquisition of the necessary IT skills represents a fundamental aspect. In this respect, the digital divide metaphor proposed constitutes a useful interpretation tool for policy analysis and decision making.

In addition, a careful management of the evolution of digital gaps by policy makers seem to be desirable and necessary. At the same time, attention should be put toward avoiding technological deterministic approaches aimed at fostering technology adoption and use *per se*. Rather, the use of technology should be advocated as an important enabling tool supporting individuals in their main everyday activities (production, social, political, consumption, savings activities – [24]). Hence, this should translate to public policies framing the problem from a multitude of perspectives and fostering the diffusion of IT as well as other important complementary skills.

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Interpreting E-Government: Implementation as the Moment of Truth

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Abstract. The dematerialisation of the document flows received and sent by the public administrations (PAs) is one of the main cornerstones of the Italian e-government programme. The empirical data relative to the diffusion of the new document management systems reveal that today less than half of Italy's central PAs have attained an adequate level of project advancement in terms of the Computerised Correspondence Register (the system whereby each document is automatically filed and retrieved), despite the fact that the deadline for compliance was 1 January 2004. The paper develops a number of reflections to understand the idea of change that guided first the legislator and then the monitoring authority. The thesis advanced is that also when implementation seems problematic, the rhetoric of managerialism dominates the e-government discourse. Through our reconceptualisation we argue that e-government reveals its organisational implications only when the statements of principle are translated into concrete actions and decisions.

Keywords: e-government research, e-government implementation, document processing, public administration, organisational change.

1 Introduction

E-government is perceived as the latest trend in a set of market-driven reforms launched by many governments since the early 1980s [18, 19, 27]. Most OECD countries have formulated ambitious action plans for implementing e-government. The aim is to move service delivery to the World Wide Web, to enhance information to citizens and to make public-sector workplaces smarter for the benefit of citizens, politicians and civil servants alike [21].

e-government is a typical example of IT-enabled change where, up to now, the effective results have been quite variable (according to [20]: “the expected payoffs from automation have been slow to be realized”) and “over-enthusiastic rhetoric has often been substituted for clear thinking” [10].

The rhetoric informing current governments reform efforts can be traced to the widespread decision to transpose and use the models and practices typical of the business community [1, 9, 7]. e-government managerialism - according to ([3], p. 272) - can be summarised as follows: a concern with the “efficient” delivery of government information to citizens and other groups of “users”; the use of ICTs to

improve flows of information within and around government; a recognition of the importance of “service delivery” to customers”; the view that speeding up information provision is, *by itself*, “opening up” government (...). ”

Within the managerial model, the rationale to invest in e-government is provided by increased efficiency and savings in administrative costs [19]. There is an assumption that (public) managers are capable of exploiting technology in coherence with the goals and are able to steer the organisational change as they please. The dominant response to contradictory outcomes and the frequent failure of programmes to achieve their intended effects consists of the argument that failure is a function of lack of management competence in the use (or awareness of) managerial techniques. An alternative view is one that emphasises the structural constraints on management practices. On the other hand, the latter position suggests that management’s room for manoeuvre is limited.

At this point, the question that springs to mind is: given that the actual success of the models inspired by management practice (often referred to the New Public Management, NPM) is anything but a given in public service organisation, how can we explain the assumed superiority and attractiveness of these models on the ideological and cultural front? [8] (p. 7) argue that the appeal of the NPM lies in the claim that it delivers improved public services and that it represents an empowerment of those it employs and those it seek to serve. The first strong reason of success is that management practices from the business community are considered to be superior to those of the public sector [2]. According to their supporters, the managerial prescriptions have the merit of forcing bureaucrats to become managers, to look ahead towards the effects of their actions, instead of always looking backwards to the conformity of their statutory acts. The second reason for the success of business methods has been further strengthened by the development of ICT. The diffusion of DBMS, the fourth-generation languages and application packages offering multi-dimensional analysis and control systems (e.g., CRM, Customer (or Citizens) Relationship Management), make the decisional techniques - which yesterday seemed overly complex due to the high number of variables involved or the quantity of data to explore - appear more realistic and manageable.

This article addresses the theme of e-government implementation, highlighting the inherent problems. Unlike the contributions that seek to identify appropriate indicators or factors of success in e-government projects (for an interesting review of the literature on these themes see [22]), this study aims to demonstrate how the e-government discourse, also in those cases in which implementation has led to disappointing outcomes, is pervaded by a good dose of managerial rhetoric [6].

Our research approach looks at the bigger picture in order to analyse the recent experience of Italy’s central Public Administrations (PA) in implementing the national e-government plan for de-materialising documentation flows. The business of archiving and classifying documents – under the scope of the so-called Computerised Correspondence Register (CCR) – takes on an essential role in achieving the transparency objectives of the administrative action. Based on the latest periodical survey carried out by the independent authority (CNIPA, the National Centre for the Computerisation of the Public Administration) to assess the progress of the “CCR Project”, the paper wants to offer a contribution to understanding the idea of technological change as envisaged by the Italian e-government programme. As

[27] underscores: “It is vitally important that we have a clear conceptual framework for the analysis of e-government”.

The theme of document management takes on special relevance due to its pervasiveness – no public administration, either central or local, is excluded – and economic importance. CNIPA’s estimates point to 160 million incoming and outgoing documents in solely the Italian central PA. In addition, the estimates indicate that if the public administrations were to fully use the CCR, then postal franking costs alone would be cut by €60 million. Nevertheless, despite the fact that the use of the digital correspondence register has been compulsory since January 2004, the state of implementation in compliance with the requirement has been defined by CNIPA itself as “insufficient and inadequate”.

In the pages that follow, we will first provide an overview of the salient contents of the national project and the methods used by the 61 subjects making up Italy’s central PA to implement it. We will then look at the prevailing interpretive key adopted by the work group mandated to monitoring the activity and highlight its limits. In parallel, we will try to show how the managerial rhetoric fails to help us adequately interpret the situation in the Italian PA in terms of organisational change. The interpretive key proposed by the paper stands out from the mainstream in terms of its specific contents, but above all, its conceptual assumptions. Our reinterpretation is based on some alternative theoretical proposals. The treatment of the Italian case draws on data from a number of public sources: official documents, reports, conference papers and various online materials. The paper ends with our summary and conclusions.

2 Case: Redesigning and De-materialising Document Flows

In the sphere of the e-government development plans promoted by the Italian authorities, the computerised correspondence register (CCR) is part of a far-reaching project to redesign the administrative action and facilitate public sector reform. Indeed, according to the legislators, the CCR is not a mere tool for automatically encoding the incoming and outgoing documents, but the cornerstone on which to implement the principles of efficacy, publicity, transparency and accountability in line with the public administration’s strategic development and rationalisation goals.

The regulations establish that all the Italian administrations must upgrade their information resources and organisational practices by 1 January 2004, to enable the introduction of the new electronic systems. The legislators, despite requiring the administrations to implement the CCR within the “minimum nucleus” – which means solely the part that automates the marking and registration of the document – actually indicated a more ambitious goal, seeing that as early as 2000 they were talking about computerisation not limited to the initial phase of the incoming document, but extended to the whole of the procedure’s lifecycle.

The Italian government has mandated the monitoring of the project to an Authority called the National Centre for the Computerisation of the Public Administration (CNIPA). In 2002, CNIPA established a special Competence Centre to function as the reference point for the entire PA, but also gave it other functions of guiding and supporting the implementation of the register. At the time of writing this paper, the Competence Centre had conducted two fact-finding surveys, for which it prepared a

questionnaire to gather “information useful to assess the level to which the central PAs have achieved the objectives called for by the law” ([4], p. 79).

2.1 Levels of Diffusion

The following data refer to the situation as at 30 April 2005 in all 61 central public administrations. Overall, 82 surveys were conducted in the same number of organisational units. The aggregate number of employees working in these structures was about 650,000.

We make the distinction between the CCR and document management because the level of implementation and use of these two types of ICT solutions differs significantly. In terms of the CCR, 34 administrations had reached a good level of diffusion, with the system handling just short of half of the overall documentation volume managed; 17 administrations had just completed the technical project and had implemented solely a pilot office; a further 17 were still in the project development stage; and a good 14 had not yet gone operational. However, document management lags even further behind, seeing that 55 administrations had not yet planned any operational move, 27 had already come on stream, but of these 15 – excluding the six that have reached a level of document filing and management of around 80% and the other six that had reached between 20% and 80% - which account for 60% of total volumes managed, had reached a computerised filing level of less than 20%.

The documents registered electronically as at April 2005 accounted for about 40% of the total and the forecast for June 2006 was 60% of the total documents managed. While this is an important jump, the administrations are still a long way from achieving the widespread diffusion that one would expect, given that the legal deadline for this type of functionality was 2004. The situation of the electronically filed documents is even poorer: 23% in April 2005, estimated to rise to 37% in 2006.

Table 1 shows the distribution of the projects and/or the services implemented by the administrations relative to the functions deployed (one individual project can cover one or more functions). Roughly 85% of the projects in question have implemented the minimum nucleus of the CCR, of which 13% in the form of ASP (Application Service Provisioning). Just over 42% of the projects centre on document management functions, of which, 2% in ASP mode. Some 31% of the solutions used perform workflow management functions. Around 13% of the active systems incorporate administrative transparency functions and about 32% offer CCR interoperability functions.

The data outlined in Table 1, below, relates to a total of 111 projects/services.

Table 1. Distribution of the Computerised Correspondence Register by Type of Solution (Source: [4])

Functions	Number of Projects/Services	% Projects/Services
Computerised Register (CCR)	94	84.7%
Document Management	47	42.3%
Workflow Management	34	30.6%
Administrative Transparency	14	12.6%
CCR Interoperability	36	32.4%

But what are the reasons for this problematic situation? According to the CNIPA questionnaires, the administrations' more frequent criticism was the lack of financial resources to dedicate to the project, while other delicate aspects underscored in the responses included the technical difficulty of implementing systems with adequate levels of security and reliability. In addition, the PAs also cited problems related to the integration of document management (which is a typically horizontal process, meaning that it crosses the entire organisation) with the vertical legacy systems. The information gathered from the monitoring process also reveals difficulties such as defining the requirements of the new system, project duration (still an average of three years from definition of the specifications to effective implementation) and in organisational planning (staff training, infrastructures, implementation documentation, etc.). Other cases cite the further problem of harmonising the new system with existing operating practices. In short, Italy's central PA is still far from that widespread use called for by the law in force.

The monitoring group's last report says that a specific law was enacted far in advance (starting 1998) to enable the administrations to respond within the deadlines established and to give the suppliers time to develop adequate technological solutions to meet the needs expressed by the administrations. Moreover, CNIPA made various kinds of operating tools available – including turnkey solutions like ASP – to accelerate the implementation of the CCR, also by those administrations with fewer resources to invest. But all this has not been enough because, more than two years after the enactment of the law, the level of implementation – in terms of both the general implementation of the programme and the operating volumes managed electronically – remains far below expectations. The situation is even more surprising if we take into account that this concerns the implementation of what [11] define as the 'mandatory solutions due to legislation, where there is no option but to proceed'.

2.2 The Evaluation Model Developed by CNIPA

In this section we will look at the evaluation model developed by CNIPA from a closer angle, not merely to describe its contents in detail, but to get the full picture drawn by its inspirational logic. In general terms, we can say that CNIPA has identified a number of factors (Fig. 1) it believes essential for the purpose of implementation, which are: the level of implementation of the electronic document management requirements, the effectiveness of the projects and/or services developed and the project risk levels. The model also comprises two other "functional" indicators related to each of the administrations analysed, that is: the organisational complexity and the level of general computerisation.

In addition, the model envisages two indicators of the compound type:

- Implementation effectiveness (computed based on the indicators: "Project Effectiveness" and "ASP Effectiveness"); and
- General criticality (worked out based on the indicators "Contextual Complexity" and "Project Risk").

The indicators making up this system all share a common denominator in their measurability. Indeed, each factor can acquire a value on a scale of 1 to 5 and each administration responding to the questionnaire was asked to indicate its position for

each indicator. CNIPA plans to use this methodological approach to facilitate the computation and comparison of the results in line with a number of criteria – by category and size of administration, by type of technical solution, by functionalities implemented, etc. In addition, the model makes it possible to follow the temporal evolution of the projects as these proceed at the national level in terms of resources absorbed, processes launched, number of homogeneous organisational areas (AOO) affected by the project, products supplied, number of staff assigned to the registration activities, results achieved and so forth.

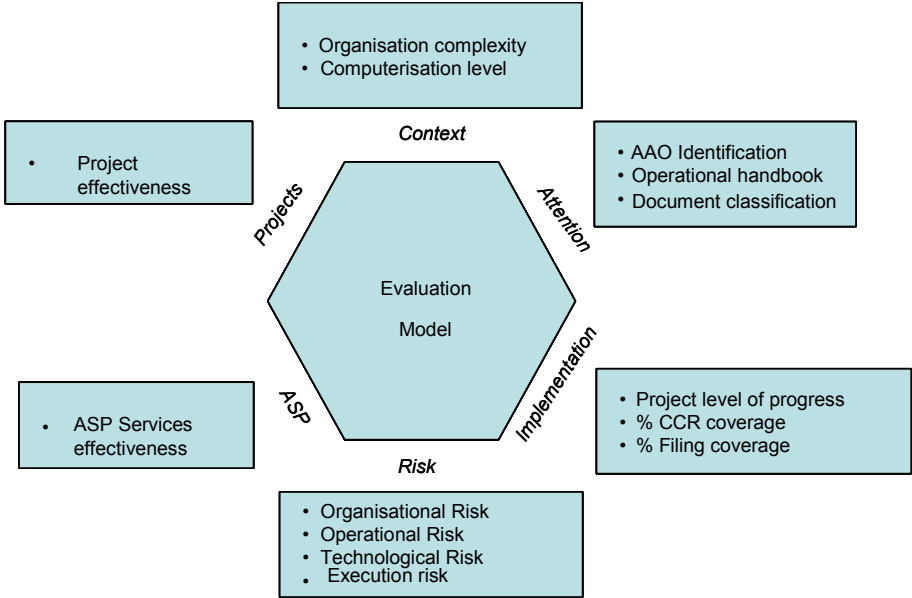


Fig. 1. The CNIPA Evaluation Model (Source: [4])

To sum up, the model developed by CNIPA embeds a simple one-directional causal model which links means and ends. CNIPA traces the effective implementation levels of document management solutions to the values given by a series of (static) indicators in relation to each central PA unit. The differences encountered between one context and another are then traced to the diverse weighting represented by each parameter, in other words, to the failure to comply with the legislative provisions.

3 Interpreting Organisation Change in PA Settings

At this point, it is interesting to reinterpret the snapshot provided by the CNIPA report in terms of the theoretical comparison. We will use this comparison to try and clarify why the evaluation model adopted as part of the project monitoring process is unsatisfactory, inasmuch that it does not help us to correctly interpret the highly mixed empirical evidence that characterises Italy’s central PA. In other words, the

model does not seem to be able to explain why the same regulatory framework, along with the same requirements for ICT artefacts (i.e. the document processing solutions), can lead to different outcomes in different as well as in similar organisational settings.

Our interpretive approach will use the contributions found in organisational literature and especially the suggestions offered by three different theoretical frameworks: the contingency theory approach [13]; the transaction costs theory [28] and the theory of organisational action [26, 15]. While we do not have room here to fully describe or reconstruct the specific nature of the cited theoretical proposals, the reader can use the bibliography to refer to the original texts cited.

3.1 The Contingency Theory Approach

In line with the contingentist view, the model developed by CNIPA represents a “a complex set of interrelationships among internal organizational states and processes and external environmental demands” [13]. It reflects a kind of ideal pathway that should lead the administrations to adopt – in a logic of adaptation – the technological and organisational provisions called for by the law on the management of document flows. The basic problem addressed by this model is that of implementation and compliance with the regulatory requirements. The differences resulting from these regulations and the concrete reality, in fact, are placed in relation to a number of variously determined factors. Nevertheless, it is clear that the number of variables taken into account is limited to a few elements, for which, moreover, we do not know their weighting in relation to other elements not included in the model.

The contingentist view also takes into account the role attributed to staff training. The CNIPA report ([4, p. 19) correlates the slowness of the CCR’s diffusion within the PA with the low percentage value (lower than 5%) of staff involved in training activities, as well as underscoring the modest “22% of fully implemented training programmes” (ibidem, p. 63). And again (ibidem, p. 59): “The (...) preparatory training of staff for the effective implementation of the CCR (...) must be considered an *implementation condition* of the new processes (our Italics, editor’s note) (...). For this reason, the analyses of the effective state of the training activities are efficacious indicators on the general state of the application of the law”.

On its own, the meticulous scanning and the extreme formalisation of each step in the implementation of the e-government plan should help the administrations identify the actions required. The law prescribes that the administrations implement a group of solutions, establishing in a binding manner the time horizon for introducing the document flow management systems, but at the same time leaving “each administration to choose which organisational method and technology solutions to adopt”. In practice, the CNIPA model significantly simplifies (by reduction) the scope for technical-organisational options and the correlated implications. Management is asked to deploy a number of resources in a scope that, in reality, is well pre-defined.

For example, the law requires that the public sector managers identify which of the offices in their respective structures should be assigned to deal with either the single or the coordinated management of documents for large homogeneous organisational areas (AOO), ensuring the adoption of the same classification and filing criteria as well as the internal communication between the same areas. The law also clarifies that - in addition to improving internal efficiency - the document processing tools must enable the citizens,

the companies and the other administrations to access the state of the procedure and the relative documents. In addition, for all this to come about (interoperability), the different administrations must use standard languages and communication protocols in conformance with the special technical specifications issued at the time by CNIPA. The interoperability concept indicates the possibility for the incoming CCR system of one administration to deal automatically with the information transmitted by the outgoing CCR of another administration, with the goal of automating the underlying processes and activities.

The complex issues of change – think only of the problems involved in coordinating the offices, sharing information and knowledge, and consolidating the new organisational routines – remain in the background. As we can see, the main question for the interested administrations is reduced to finding the best combination between the given factors, in line with predefined criteria. If an administration's internal states and processes are consistent with the “external demand” (i.e., legal requirements), then the CNIPA model suggests that it will be effective in dealing with its environment.

3.2 The Transaction Cost Theory

The transaction costs theory is the second framework that can be used to interpret the case in question. This theory [28] is widespread also in business practice to address all those problems that, directly or indirectly, presume relations of a contractual type. It is a well-known conceptual framework that centres on the need for the organisations to economise on transaction costs.

Let us return to the Italian case and take a specific look at the role of the technologies. The CNIPA model counts ICT as a “qualifying factor” that, therefore, enables each PA to structure itself appropriately to gain the highest possible benefits – in terms of effectiveness and efficiency – from the solutions implemented to comply with the law. The empirical data show that the implications of adopting document processing systems on the transaction costs are ambiguous. Indeed, on the one side, the 2006 report indicates an overall recovery in efficiency, given that the implementation of the AOO was accompanied by a downsizing effect, in terms of the reduction of the total number of structures allocated to the CCR process – which have shrunk from 18,944 to 15,326 – as well as a reduction in the number of employees assigned to the registration activities. On the other, the same report underscores that the ASP mode – which, at least on paper, offers significant advantages in terms of transaction cost savings – is an option that continues to be little diffused among the administrations.

This ambiguity is due to the simplified representation of the reality locked into the regulatory framework and the evaluation criteria adopted by CNIPA. The legislator wanted to stimulate the individual PA to introduce “transversal” criteria into their traditional organisational structure by function and reduce the “crossing time” of the information. The reasons are clear. The introduction of standard communication methods – implemented through advanced protocol and workflow management solutions – promises the implementation of a “low-cost” coordination (that is, without the need for direct relations) between the various subjects, inside or outside the administration. Nevertheless, it would be deceiving to think that the generalised use

of a new technological platform on its own – even though imposed by special regulations – could ensure the effective and concrete cooperation between the different offices or even between the different PAs. As indicated clearly by [12] concept of interoperability does not concern the mere physical connection of networks, technological platforms, software applications and data (in this sense, these authors use the effective expression “digital plumbing”), but actually requires specific interventions in the organisational coordination and control mechanisms. In addition, we need to consider the fact that the same administration often deploys various forms of document management – from the more traditional to the electronic. These tools (in potential conflict) increase the organisational complexity and certainly do not help reduce transaction costs.

3.3 The Theory of Organisational Action

A theoretical perspective that puts the emphasis on processes of action and decision [26] offers an interpretive framework for the “CCR Project” that underscores the diverse implications. In particular, the theory of organisational action (TOA) focuses on the processes of design, adoption and use of the computer artefacts [14, 15, 17].

If we treat the organisation in terms of “organising action” we can highlight how the introduction of electronic document management solutions in Italian PA transcends the “boundaries” of the individual administrations. Planning and implementation lose their connotation of discrete activities – that is, defined once and for all – to instead become processes distinguishable purely on the analytical level and that are carried out without solutions of continuity. The focus on the processes of action and decision enables us to trace the concrete implications encountered by many administrations in implementing the CCR Project not so much to contextual variables, barriers or general phenomena of “resistance to change” but, conversely, to the outcome of the bounded rational processes of action and decision [24].

The TOA approach recognises and addresses the problem of transactional efficiency but in no case can it be considered the only guiding criteria in the choices of organisational planning. The search for “critical success factors”, typical of the contingentist approach, thus leads to the analysis focus on organisational choices. In this way it is possible to capture the ongoing interactions of processes at the different levels. Coming back to the CCR Project, the provisions that oblige the PA to establish AOO and to ensure what is called administrative transparency acquire importance in that these are connected to the organisational regulation, i.e. coordination and control processes. Implementation is no longer the mere execution of the prescriptions issued from above, but becomes coordination between several subjects, each with their own resources, constraints and logics of action. This non-deterministic key enables us to interpret the choices that have led many Italian PAs to tackle the CCR project by circumscribing the extent, or by limiting themselves to implementing simply the document “marking” functions. In other words, the dialectic relation between formal and informal rules of regulation can lead to diverse courses of action: compliance with the norms or, vice versa, delays or conflicts. The whole of which fits into a framework of possibilities that are neither optimal nor predictable.

4 Summary and Conclusions

In this paper we argue that the rhetoric of managerialism continues to frame the implementation of e-government projects. This rhetoric proposes an unacceptable simplification of the organisational discourse. It is not hard to spot the presence of firm determinism in the current debate, which assigns a prominent weighting to the technological component. The implicit assumption is that a technical solution with optimal characteristics will intrinsically ensure the attainment of the desired results, or of the organisational “one best way”. Therefore, according to the mainstream, the basic problem of e-government lies in the choice of the “right” ICT system (e.g., between the diverse document processing or workflow management solutions).

By affirming that technology is the “driver” of modernisation in the public administration, CNIPA ([5] p. 5) assumes that organisation and technology are two separate and reified elements. As noted by ([16], p. 365) “if we keep seeing technology as “something” separated from the organisation, we still remain within a deterministic or co-deterministic frame”. In addition, this separation leaves unsolved the problem of explaining why - despite the high level of standardisation of the technological solutions, the relative ease of their acquisition and their low cost - we can still observe, after more than three years since the CCR law was enacted, significant delays and differences in the use of the new systems, even between administrations with similar features.

This paper has sought to overcome the dominant rhetoric by shifting the focus to the conceptual aspects. We have used some of the proposals found in organisational literature to reinterpret and comment on the Italian case. We have drawn upon the theoretical contributions that presuppose the need for the organisation to adapt to contingent factors, such as: changes in the law, different environmental conditions, technological features, the minimisation of transaction costs, etc., as our interpretive starting point in analysing and discussing the situation of the Italian central PAs. We then proceeded in a similar way to adopt an alternative approach (theory of organisational action, TOA), which has provided us with numerous ideas for reflection. This direction sees technology not as an external factor that “propels” organisation change in specific directions, but as an organisational choice itself.

After reading the CNIPA reports, we can see clearly that the focus has been placed almost entirely on the planning process. It has also emerged that CNIPA has assumed that the adoption of the new practices by the PAs would happen “naturally”, that is, based on the regulatory requirements and the opportunities offered by the technological tools, their relative accessibility and ease of use. The misalignments and mixed empirical evidences that characterise the Italian scenario have been read not as a manifestation of discretionary margins that are anyway insuppressible in complex organisations, but as preconceived resistance and opposition to the change [6, 7, 23].

Adopting an alternative stance, the reasons for the lack of CCR diffusion must be looked for in the decisional processes of *planning*, *adoption* and *use* of the technological artefacts. Viewing e-government as a process primarily means sustaining that its identity is revealed only when the statements of principle (e.g. in the form of regulatory norms and plans) translate into concrete actions. The proposed interpretive framework enriches our knowledge of e-government implementation not

only for Italy but also for other contexts. It can be adopted for empirical investigations and also to evaluate e-government programmes.

Ultimately, we underscore that the study does not intend to diminish the importance of the e-government development strategies. Nor do we wish to draw a veil of pessimism or cynicism over the great hopes that accompany its realisation. The CNIPA model is unquestionably useful for capturing some general trends and recording the state of progress of the CCR project, but even so, it cannot be deemed a generalist interpretive key for all the administrations involved on this front. Instead, as suggested by [25], in the future it would be desirable to undertake a full analysis of the costs and benefits of such a scheme.

At this point, the reflection moves away from the Italian case to launch a consideration with a much larger claim of validity: when the suggestions for developing e-government are cast off from that particular type of knowledge that an approach such as that proposed here can give, even the most obvious advice can turn into an obstacle, instead of a resource. The main thing is not to lose sight of the fact that the best managerial intentions can become the worst solutions to the problems, also in the field of e-government.

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Website Evaluation Questionnaire: Development of a Research-Based Tool for Evaluating Informational Websites

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Abstract. Online questionnaires are frequently used to monitor the quality of municipal and other governmental websites. In the present situation, many government organizations seem to reinvent the wheel and develop their own questionnaire. This leads to the undesirable situation that website quality is often assessed with instruments that are not comparable with each other and are not empirically validated. This article presents a generic Website Evaluation Questionnaire (WEQ) for the evaluation of informational websites. The WEQ was developed on the basis of the literature on usability and user satisfaction and was tested and revised in several rounds. This has resulted in a reliable questionnaire measuring clearly distinct quality dimensions of informational websites. The WEQ can be used by governmental organizations for evaluating their websites and for benchmarking their results against each other.

Keywords: Website design, website evaluation, questionnaire, website usability.

1 Introduction

The pressure on governmental bodies to develop websites that enable citizens to participate in a modern democracy has reached high proportions [1]. Governments do not only provide information to their residents but increasingly use their websites to facilitate interaction and offer online services to national and international audiences. Websites have evolved to important information and service channels between governmental organizations and citizens and other stakeholders. Evaluation research is necessary to monitor and further improve the quality of these websites. Several expert-focused and user-focused methods are available for this type of evaluation research, of which (heuristic) expert evaluation and think-aloud usability testing are the most current laboratory approaches. These approaches typically produce detailed and diagnostic feedback, which may be used to revise a website or certain web pages.

A more coarse-grained evaluation method which focuses predominantly on the overall quality of websites is the online questionnaire. Many governmental and other

organizations use such a questionnaire to collect feedback on their website from real visitors. Online questionnaires are a cheap and easy way of gathering user feedback. Most of these organizations develop their own evaluation questionnaire, which has the potential advantage that the questions asked may be tailored to the specific characteristics of the website, but also has two important drawbacks. First, the evaluation results of governmental websites cannot be compared to each other, due to differences between the questionnaires used. Second, the validity and reliability of all individually developed questionnaires is questionable or at best unknown.

In this paper, we will describe a project aimed at developing and validating a generic Website Evaluation Questionnaire (WEQ), which may be used to evaluate municipal and other governmental websites. We will first address the criteria for a methodologically sound questionnaire. After that, we will discuss previous, more general, web evaluation questionnaires available in the literature. Then we will outline the design of the WEQ and describe the various studies we conducted to assess and improve its validity and reliability. The WEQ itself can be found in the Appendix.

2 Validity and Reliability of Web Evaluation Questionnaires

On the internet, many examples of problematic questionnaires can be found, underlining that designing a good survey is not an easy task. It is all about identifying the relevant constructs to be measured and asking the right sets of questions to measure them. We will discuss three important topics concerning validity.

- Which definition of website quality is used?
- How do the results of a questionnaire relate to the respondents' experiences when using the website?
- How does the group of questionnaire respondents relate to the website's overall target audience?

The first important issue is the definition of website quality. There is no agreement about the question what website quality exactly is and which dimensions or items a questionnaire should contain. In the case of informative websites, it seems plausible to connect website quality to usability. Nielsen & Loracher [2] define the concept of usability as follows.

'... a quality attribute relating to how easy something is to use. More specifically, it refers to how quickly people can learn to use something, how efficient they are while using it, how memorable it is, how error-prone it is, and how much users like using it.' (Nielsen & Loracher [2] p.xvi).

This is a rather broad focus which relates to a wide range of (specific) usability guidelines as presented in their recently published book, varying from the optimal place to put links, to choosing fonts, to tips for the right place to display prices. In this definition, three notions of the ISO standard can be found: effectiveness, efficiency and user satisfaction [3]. The definitions of Nielsen and ISO are most frequently referred to in the literature on website usability.

In a review of 180 studies on usability, Hornbaek distinguishes between subjective and objective measures of usability—e.g., perceptions of task difficulty (subjective) and usage patterns (objective) [4]. The aspects of website quality that can be measured using a questionnaire are limited to the subjective experiences of visitors. Visitors may have opinions about the website itself, about the process of using it, and about the outcomes of their interactions with the website. Their opinions about the process relate to the navigation process and the accessibility of information. The visitors' opinions about the outcome concern the quality of the information found.

The second issue is whether the task of filling out an evaluation questionnaire really reflects the opinions visitors had when using the website. The process of answering a questionnaire is complex and may lead to biases. Sudman et al. [5] give an overview of the tasks respondents must perform when answering questions. They must first interpret the question and understand its meaning. If the question involves an opinion, respondents must retrieve a previously formed opinion from memory or decide on an opinion at the very moment. To form an opinion, they need to make a mental representation of the artifact they are to evaluate and retrieve or construct a standard against which it can be evaluated. Then their opinion must be communicated to the researcher, often after formatting the response to fit to the response alternatives provided with the question. A common bias in usability research, which we also found in our pilot studies, is that people tend to be more positive in a questionnaire than would be justified considering the usability problems they have encountered. It is imaginable that people filling out a questionnaire have forgotten many of their problems using the website, and that the questionnaire creates new attitudes that respondents were not aware of during navigation.

The third issue is the representativeness of the sample of respondents. Couper [6] discusses two problems that are important for governmental website evaluation. The *sampling error* is the problem that not every member of the population has the same chance to be included in the survey. An example of this error is that people who enter the website via other routes than the homepage may not see the survey when it is only shown on the homepage. Another problem is the *nonresponse error*, which means that not everyone in the target group will be inclined to participate. For example, a lack of time, a negative attitude toward the organization or technical problems can keep people from filling out the questionnaire, which may lead to a non-representative sample. Little is known about ways of motivating people to take part in a web survey. Dillman & Bowker [7] present some advice for motivating people, but they point out that there is only little or no experimental evidence and underline the need for more research on this topic.

Having discussed three aspects of validity, we will finish this section with discussing the reliability of questionnaires. In the context of this paper we concentrate on the idea of item-reliability. This involves the question whether website quality dimensions are measured in a consistent way. Items that are supposed to measure the same dimension should have a Cronbach's alpha of at least .70. Low reliability scores can be caused by difficult or ambiguous formulations. Molenaar [8] gives an overview of several types of such formulations and their effects on the responses.

3 Previous Questionnaires on Website Quality

In the literature, we found three earlier research projects focusing on the systematic development and validation of website evaluation questionnaires. We analyzed these studies with the purpose of defining dimensions of website quality for the WEQ. The analysis focused on dimensions that relate to the navigation process and dimensions concerning the quality of the information.

Kirakowski [9] describes the Website Analysis Measurement Inventory (WAMMI), a questionnaire consisting of 60 questions, which have to be answered on seven-point Likert scales. The concept of website usability is divided into five categories. The degree to which users:

- feel efficient
- like the system
- find the system helpful
- feel in control of the interactions
- can learn to use the system

These five categories are the result of an analysis of the feedback that was produced by a large group of website designers and users. Kirakowski reports high Cronbach's alphas (between 0.70 and 0.90) for the dimensions. For practical use, the WAMMI questionnaire has been reduced to a set of 20 questions, which place less of a burden on the respondent. The first four dimensions are for the most part related to the users' attitude towards the website and the process of interaction. The last category of *learnability* presupposes that the site will be visited repeatedly by its audience. In the context of governmental websites, we think this category to be less relevant, since the low frequency of citizen visits will not allow them to really learn to use the site.

Van Schaik and Ling [10] developed another evaluation questionnaire, which also consisted of five categories. Their dimensions are:

- perceived ease of use
- disorientation
- flow
- perceived usefulness
- aesthetic quality

Respondents visited a university website and performed three information retrieval tasks. After that, they filled out the questionnaire, which consisted of 30 questions. The authors report high scores on the Cronbach's alpha (between 0.74 en 0.89). In a post-hoc analysis they decided to split the *flow* dimension into two sub dimensions: *involvement* and *control*. The first three categories are clearly related to attitudes towards the interaction process. The *perceived usefulness* seems to be related to attitudes towards the outcome of the process. A new category is the *aesthetic quality*, which focuses on the general appearance of the website itself.

In our view, the dimension of *flow* is less relevant in the context of governmental websites. *Flow* is defined as a psychological condition in which a person feels cognitively efficient, motivated and happy. Citizens that visit websites in order to find

out how to get a new passport or to inform the local authority about a change in their address, will not expect these sites to create a feeling of flow.

According to Lavie and Tractinsky [11] the aesthetic dimension may be divided into a notion of classical aesthetics (a clear, clean, symmetric and pleasant design) and expressive aesthetics (creative, fascinating and original design). They found a clear correlation between the first notion and attitudes towards the usability of a website. This would mean that a “classically designed” website helps people to better perform their tasks. For governmental websites this notion might be relevant. We do not think visitors expect these sites to be original and fascinating, so the second notion of aesthetics will not be incorporated into the WEQ.

Muyllé et al. [12] developed the WUS (Website User Satisfaction questionnaire). This 60 item questionnaire consists of four main dimensions of user satisfaction and eleven sub dimensions. A sample of 837 website users filled out this questionnaire after having visited a site of their own choice. The authors report high reliability rates (between 0.74 and 0.89). A confirmatory factor analysis supported the distinction in four main dimensions and eleven sub dimensions:

- connection
 - ease of use
 - entry guidance
 - structure
 - hyperlink connotation
 - speed
- quality of information
 - relevance
 - accuracy
 - comprehensibility
 - comprehensiveness
- layout
- language

The first dimension of *connection* clearly is related to the users’ attitudes towards the interaction process. The second dimension *quality of information* is related to outcome attitudes. The *layout* dimension is strongly connected to the aesthetic quality in the classical notion that we discussed above. The *language* dimension is defined as the degree to which the choice of the language of communication is tailored to the user. In multilingual countries like Belgium, this may be a relevant aspect. For the questionnaire we developed, it seems more useful to aim a *language* dimension at the comprehensibility of the language use on the website.

For the development of the WEQ we concentrated on three dimensions: the attitudes towards the interaction process, the attitudes towards the outcome of the process and the attitudes towards the classical aesthetics. Our starting point was the WUS, because this questionnaire focuses more than the other two on users who are searching for information on a website. Moreover, the WUS pays a lot of attention to the quality of information, which we consider highly relevant for the domain of municipal websites. There are two major changes between the WUS and the first version of our questionnaire. The first change concerns the *language* dimension. We transformed the questions about language choice into questions about the language

use in the website and put this as a sub dimension under *quality of information*. The second change was the introduction of a new sub dimension in the *connection* section with questions about the search engine. We consider this to be an important tool on informational websites, where people want to find the information they are looking for in a fast and easy way.

4 Development of the Website Evaluation Questionnaire (WEQ)

The first version of the WEQ was tested on several municipal websites and on two websites that provide information but also entertain women (Cosmopolitan) and boys (Kaboem). In five studies different versions of the questionnaire were tested by 1104 respondents. Table 1 presents an overview of these studies.

Table 1. Five studies with different versions of WEQ

Websites the questionnaire is tested on	Number of respondents
Study 1: Cosmopolitan	465
Study 2: Kaboem	264
Study 3: Municipal website A	40
Study 4: Municipal website B	187
Study 5: Municipal website study C	148
Total number of respondents	1.104

Our main focus of analysis was on the reliability of the dimensions of the WEQ. We determined the reliability by computing the Cronbach's Alpha of every dimension. We aspired to reach for each sub dimension reliability scores higher than .70. Questions causing low reliability were revised or removed. This process was complemented in study 3 by think-aloud protocols of 40 respondents who commented on the questionnaire. This feedback helped us to diagnose the questions that resulted in low reliability scores, which led to three considerations for changing questions.

The first consideration concerned the perspective in every question. To stimulate people to give their own opinions (instead of taking on a jury role and speak for others) the questions were explicitly formulated from the respondent's perspective, as in *I find this website easy to use* versus *This website is easy to use*.

A second consideration was the finding that it is difficult for people to handle negations. Results of think-aloud protocols showed that people found it difficult to disagree with a negatively formulated assertion. This effect seems stronger when the word 'not' is used than when the negative connotation is in the word itself, like in 'not useful' versus 'useless'. So we tried to avoid the word 'not' in the questions.

A third consideration was the use of jargon. Several words proved to be difficult for people and were not interpreted correctly. An example is the term 'structure' which obviously led to very different interpretations. Some respondents gave their opinion about the menu on the homepage, others judged the quality of the links or judged to what extent they got lost on the website. The present WEQ contains five questions about the structure of the website and in only one of them the word

‘structure’ is used. In this way we can see to what extent the answers on the explicit structure question correspond with the other questions.

A factor analysis was used in order to assess whether the dimensions we distinguished were confirmed by the data. Results showed that four sub dimensions did not appear to measure one distinct construct. The sub dimensions *accuracy* and *comprehensiveness* had to be combined into one *comprehensiveness* sub dimension, and the sub dimensions *comprehensibility* and *language use* were combined in a new *comprehensibility* sub dimension. This resulted in the structure shown in Figure 1.

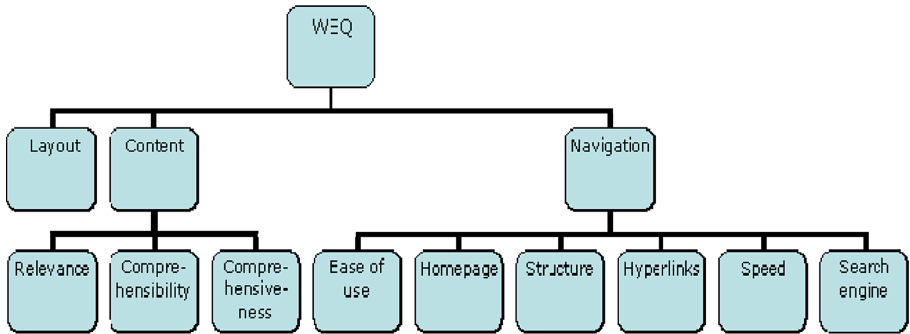


Fig. 1. Dimensional structure of the WEQ

Figure 1 presents the dimensional structure of the WEQ. The dimension of *Navigation* is related to attitudes towards the *process* of looking for information in the website. The dimension of *Content* is related to attitudes towards the *outcome* of this process: the information that is found in the website. Separate is the dimension of *Layout* that is related to the so-called “look and feel” of the website. In the Appendix all questions that correspond to these dimensions are presented. In practice the questions on each dimension are not presented together, but are distributed throughout the questionnaire.

5 Assessment of the Reliability and Validity of the WEQ

This final version of the WEQ was evaluated in two studies. In the first study 408 respondents used the questionnaire to evaluate 18 municipal websites. The structure of the WEQ and the reliability were estimated by means of Linear Structural Relations (Lisrel). In the second study we tested the congruent validity of the WEQ; 19 participants performed two tasks on a municipal website, filled out the questionnaire afterwards and then commented on their scores.

With Lisrel we estimated the model in figure 1 with ten correlated factors. The correlations between the factors show the mutual coherence between the constructs. For example the correlation between *Relevance* and *Comprehensiveness* is .80, which means that these constructs measure different things, but also are also closely connected and in this case both measure an aspect of *Content*. The correlation between the dimensions *Homepage* and *Hyperlinks* is .97, which means that it is

doubtful that these constructs measure different things. We have therefore decided to put them together in one dimension *Hyperlinks*.

The reliability is determined by means of Lisrel for the complete questionnaire and for the different dimensions and sub dimensions of the WEQ. Table 2 shows that the total reliability of the WEQ is high, with a score of .97. The dimensions *content*, *navigation* and *layout* also have very good scores of .88, .96 and .88 respectively. All sub dimensions, except *comprehensiveness*, have scores above .70. There are four sub dimensions marked with an asterisk. In these dimensions one question is removed to increase the reliability. In the Appendix, these questions are marked with an asterisk.

Table 2. Reliability scores of WEQ dimensions

Dimension	Number of items	Reliability
WEQ total	32	.97
<i>Content</i>	10	.88
Relevance	3	.72*
Comprehensibility	4	.75*
Comprehensiveness	3	.69
<i>Navigation</i>	19	.96
Ease of use	3	.90*
Structure	5	.80
Hyperlinks	6	.81*
Speed	2	.76
Search engine	3	.86
<i>Layout</i>	3	.88

* = one question removed

In a second study, we tested the congruent validity of the WEQ. We examined how attitude scores of respondents related to the experiences they had when visiting the website. We manipulated the tasks participants had to perform in such a way that one group was expected to have negative experiences in navigating a website and another group was expected to have positive experiences in the process of navigation. Both groups visited the same website, but with different tasks. Our hypothesis was that the first group would produce a negative attitude score on the items belonging to the dimension of *navigation* while the other group would produce a positive score on the items of this dimension. The same kind of manipulation was on the level of *content*: the first group with the difficult navigation task finally came across easy content, while the other group performing an easy navigation task was confronted with difficult content. After performing the tasks all participants (N=19) answered the questions presented in the WEQ. Afterwards they were asked to think aloud retrospectively while explaining their experiences on the website and their considerations when giving judgments on the questionnaire.

In order to assess the quality of our manipulation we scored the verbalizations of the participants while performing their tasks. An analysis of these scores confirmed that both groups had different experiences during navigation. Participants with a

difficult navigation task needed significantly more time to perform their task than participants with an easy navigation task (13 minutes vs. 8 minutes, $p < .05$). They also made on average more negative comments about the navigation process than the participants with the easy navigation task (9,1 vs. 1,3; $p < .05$). There was also a difference in the mean number of comments on the content of the website between the group with a difficult and an easy comprehension task (3,1 versus 1,3; $p < .05$). Thus, we may conclude that participants indeed experienced different processes while navigating and comprehending the information.

In order to assess the validity of the WEQ we then analyzed the scores of both groups on the items of the dimensions of *navigation* and *content*. There was a significant difference between the groups on the sub dimension *hyperlinks* with scores from 3.2 (difficult navigation) and 4.0 (easy navigation) on a five point scale ($p < .05$). There were no significant differences on the other (sub) dimensions. The mean scores on *navigation* were rather positive, ranging from 3.4 (difficult navigation) to 3.7 (easy navigation) on a five point scale. The mean scores on the dimension *content* were even more positive: 4.0 (difficult content) versus 4.1 (easy content).

After having filled out the questionnaire, all participants commented on their scores. The analysis of this feedback provided several explanations for the observation that attitude scores were more positive than what would be expected considering the experiences respondents had while visiting the website.

First, people seem to focus stronger on the final result than on the process when thinking about a website. When people had found the information they were looking for, their attitude towards the process seemed to be overruled by the positive experience of finding and comprehending the information. In the protocols we often found statements such as: "I gave this positive score because I have found the information I needed." They seem to forget the complaints they had earlier in the process, when they had no idea where to go to.

A second explanation for unexpected positive attitude scores is that respondents often blamed themselves for problems they experienced. Respondents said that they had problems with reading texts, that they just did not think logically or that they always have problems finding information on the internet. They assigned their blame not to the designers of the website but to themselves, like Schriver [13] and Serenko [14] also reported in the context of difficulties with consumer electronic products and interface agents, respectively.

A third explanation can be found in the benchmark respondents use while expressing their attitudes towards the website. Some of the respondents told the evaluator that all government websites are boring. They do not expect to have an easy navigation process and to find information that is easy to understand. This leads to a low standard against which the website is judged. Negative experiences may result in positive attitudes because elsewhere respondents may have had considerably more trouble finding the right information.

6 Discussion

The WEQ appears to be a useful instrument to evaluate municipal and other governmental websites. The nine dimensions measure the attitudes of respondents

about the navigation and the quality of the information in a reliable way. It is important that governmental organizations can use this standard questionnaire for evaluating their websites and for benchmarking their results against each other.

Research has shown, however, that we need to be careful in interpreting the results of the questionnaire. Respondents tend to give more positive attitude scores than what would be expected considering the experiences they have during visiting a website. Reasons for this are that respondents have a tendency of blaming themselves and of benchmarking against other websites. When interpreting the results this positive tendency has to be taken into account. This tendency is strongest in attitude scores about navigation. Scores about the process can change when respondents have found the information and have a positive attitude about the end result.

A subject that requires our permanent attention is the user friendliness of the WEQ. To keep respondents motivated, the WEQ should not be too long, should only consist relevant questions and the feeling of repetition should be kept down to a minimum. At the same time there is the concern of a good reliability and the diagnostic value of the WEQ. In the future we will more actively use the *routing*, which means that we leave out questions that are not relevant for users. For example the questions about the search engine will only be presented if respondents used this to search for information. In this way we try to create a questionnaire that is of high quality and is user friendly at the same time.

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Appendix: The Website Evaluation Questionnaire (WEQ)

Relevance

*I find the information in this website helpful.
 The information in this website is of little use to me.
 This website offers information that I find useful.

Comprehensibility

*I think the information in this website is described clearly.
 The language used in this website is easy to me.
 I find the information in this website easy to understand.
 I find many words in this website difficult to understand.

Comprehensiveness

Certain information I was looking for was missing in this website.
 The website provides me with sufficient information.
 I find the information in this website precise.

User friendliness

I find this website easy to use.
 *I had difficulty using this website.
 I consider this website user friendly.

Structure

I know where to find the information I need on this website.
 I was constantly being redirected on this website while I was looking for information.
 I always know where I am on this website.

I find the structure of this website clear.

The convenient set-up of the website helps me find the information I am looking for.

Hyperlinks (including Homepage)

The homepage clearly directs me towards the information I need.

The homepage immediately points me to the information I need.

*I find the homepage confusing.

*I think it is difficult to spot the hyperlinks on this website.

It is clear which hyperlink will lead to the information I am looking for.

Under the hyperlinks, I found the information I expected to find there.

Speed

I think it takes a long time to download a new web page from this site.

I think this is a fast website.

Search Option

The search option on this website helps me to find the right information quickly.

The search option on this website gives me useful results.

The search option on this website gives me too many irrelevant results.

Layout

I think this website looks unattractive.

I like the way this website looks.

I find the design of this website appealing.

Translated from Dutch. Respondents can give their reactions to these assertions on five-point Likert scales (strongly disagree, disagree, neutral, agree, strongly agree).

Analysing the Demand Side of E-Government: What Can We Learn From Slovenian Users?

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Abstract. Many surveys and studies to date have pointed out that there is a considerable gap between expressed interest from potential users and the actual use of e-government information and services. However, the factors influencing that gap have not yet been fully explained and understood. This paper therefore investigates the real driving forces concerning the ‘demand’ side of e-government and the take-up of public e-services. The paper summarises the findings of similar studies carried out in other countries and compares them with the results of the extensive study carried out in Slovenia during 2004 and 2006, with a focus on user expectations and satisfaction.

Keywords: e-government, demand, awareness, usage, user satisfaction, added value, trust, motivational factors, user expectations.

1 Introduction

In most countries, it is becoming evident, that in terms of e-government development there is a big gap between political priorities and the political agenda on one hand, and the actual take up and user expectations on the other. For years, governments indeed did not pay much attention to the users. The prevailing assumption was that the users, i.e. citizens and businesses are ‘hungry’ for e-services and all that was needed was a faster supply of e-services. Almost all the governmental efforts in most EU countries went in that direction. International benchmarking and measuring activities like CapGemini measurements in the EU and similar [16], [9] were additionally fuelling development in that direction. Only very recently was it realised that exclusively ‘supply side’ driven development will not result in the widely proclaimed outcomes and that more sensitively shaped action plans are needed in which users’ expectations and satisfaction are much higher on the priority lists.

Since 2003, more serious surveying of ‘demand side’ started to emerge including one extensive empirical study carried out in Slovenia between 2004 and 2006. When designing a detailed survey for Slovenia in 2004 the aim in particular was to obtain answers concerning user expectations from e-government and guidelines for the next steps towards a more user-oriented development of e-government in Slovenia. However, the results of the survey, which will be partially presented later in this

paper, only partially offer a clear picture of user expectations and some ambiguities remain. Surprisingly some ‘paradoxes’ also surfaced, which had been reported in some other studies in the field and which have not yet been fully explained in the available literature. Nevertheless, our own empirical study served as a basis for a more detailed comparative study of some of the issues identified as important in obtaining a clearer understanding of the ‘demand’ side of the e-government phenomenon.

This paper presents a comparative study of three selected, closely related hypotheses, which the authors are convinced are very important for shaping governmental policies in the field of further e-government development in individual countries. These hypotheses are as follows:

- *There is a gap between the interest for e-government expressed in public surveys and actual use.*
- *There are three decisive factors influencing the use of e-services: added value, public awareness of the existence of e-services, and trust (security).*
- *Simplified analysis of user satisfaction and expectations can only partially serve as guidelines for further development of e-government.*

All three hypotheses include some paradoxes concerning the real driving forces of e-government and take up of public e-services which are not yet fully understood. The first part of the paper outlines results from other authors concerning the outlined hypotheses. The second part presents the results of our own empirical study carried out in Slovenia between 2004 and 2006. Finally, the findings are summarised, compared with the initial hypotheses and a number of proposals are developed.

2 Comparative Review of Studies in the Field

In this section, the results of relevant studies in the field are reviewed.

2.1 Interest in and Usage of E-Government

A considerable gap between interest in and usage of e-government services has already been recorded in the SIBIS survey [18]. Later on, the results of the eUSER survey [10] revealed that just 10% of the population (17% of those who have contacted government in the last year) have used internet or e-mail to access government services; interestingly, the results also showed that 47% of government users intend to use internet or e-mail for this purpose in the future. The relatively high interest for e-government has also been recorded in several other studies, while, on the other hand, usage in 2006 was still very low (Table 1). According to the survey conducted by Accenture [9], e-government uptake is not optimal even in most advanced countries – 41% of regular internet users in Canada and 48% in US rarely or never have visited a government website. Not only that, e-government users are in the minority, several research works (e.g. [9], [23], [24]) have revealed that most of those making use of the possibilities offered by e-government were information seekers.

Table 1. Interest in and usage of e-government

Research	Region	Indicator	Results (%)
Interest			
eUser, 2005 [10]	EU-10	Interest/attitude towards use of internet for administrative interactions; <i>base: respondents aged 18+ intending to (re-)use internet for contact with government at least for one purpose.</i>	information search: 90 information supply (e.g. forms): 79 seeking advice: 76 signing documents: 62 make payments: 50
BISER, 2004, [8]	28 European regions	Preferences for e-services by current non-users with the potential need for e-government; <i>base: respondents aged 15+ who used the internet in the last 12 months and have got in touch with government for this purpose, but not via internet</i>	filing the income tax return: 43 request for a passport, driver's license, birth certificate or other personal documents: 57 registration of a car or other vehicle: 51
SIBIS, 2003 [18]	EU-15 / EU-10	Preferences for on-line government services; <i>base: citizens aged 15+ who used the internet in the last four weeks</i>	tax declaration: 28 / 31 document request: 35 / 29 car registration: 38 / 27 announcement of change of address: 42 / 36 library book search: 73 / 56 job search: 57 / 47 declaration to the police: 17 / 19
Usage			
Eurostat, 2005, 2006 [23]	EU-25	Percentage of all individuals aged 16-74 who used the internet for administrative interactions / Percentage of individuals who used internet in the last 3 months	obtaining information downloading official forms sending filled forms
			2005 2006 21 / 41 20 / 38 10 / 20 13 / 24 6 / 12 8 / 15

2.2 Satisfaction with E-Government and Its Future Development

In the last few years, measurements of user satisfaction have become more frequent in the e-government field. Additionally, some models for measuring e-government user satisfaction were proposed [12], [13], however, Horan et al. [12] indicate that the e-government research arena suffers from a lack of user satisfaction measurements. Some of those conducted in the recent past are listed in Table 2, indicating that existing e-government users are relatively satisfied (at least some results have been interpreted in that manner). Table 2 presents some e-government satisfaction indicators that have been measured in the past. As can be seen, the results of the eUSER survey [10] indicate that e-government users are least satisfied with the e-mail communication with government agencies, while 20% of respondents of the Top of the web survey [22] stated that it was difficult to find e-services and 13% of them thought that e-services were not easy to use. Furthermore, the results of the Australian survey [2] revealed that the least proportion of e-government users expressed satisfaction with the extent to which they can achieve what they want to do.

Users' guidelines for future e-government development can be extracted from several studies conducted in the past. The survey conducted by MORI [6], for example, identified key motivational factors for future use of council websites; among those who cited at least one possibility (51%), having an enquiry dealt with immediately (21%) and the ability to download forms (19%) were the most frequently chosen proposals. The Australian survey [2] revealed that key motivators for using the internet to contact government were time convenience (42%) and the belief that it was

faster (37%). Similarly, those were the most frequent benefits of e-services usage recorded in the Top of the web survey [22].

Furthermore, in the eUSER survey [10] some users' guidelines were identified as barriers to e-government experienced after its use; 32% of respondents (generally with a need to contact government and wanting to use more e-government) stated that they did try to use it, but they found e-services did not help them with problems or questions, 25% thought that e-services could not have been better adapted to their specific needs, and 17% of them cited that e-services were too complicated to use.

Table 2. Selected e-government satisfaction indicators

Research	Region	Indicator	Results
eUser, 2005 [10]	EU-10	Level of (dis)agreement with the following statements (1-5) among respondents who generally have a need to get in touch with government and would like to do more e-government	
		▪ information on public web sites was up-to-date and accurate	3.7
		▪ I was able to completely do or get what I wanted from the e-service	3.6
		▪ public websites provided enough information about what to do in my specific situation	3.5
		▪ the e-government services you used can take account of your personal circumstances	3.3
		▪ it is easy to see whether an email message has reached the right contact person in the government agency	3.1
AGIMO, 2005 [2]	Australia	% of contacts rated as satisfactory (points 3-5, 1-2 excluded) among respondents who have accessed government e-services in the past 2 years:	
		▪ the extent that respondents achieved what they intended	89%
		▪ the ease of using the service	93%
		▪ the ease of finding the specific information or service	90%
BISER, 2004 [8]	28 EU regions	% of respondents who have already used at least one of the following e-services in the last 12 months and be willing to use them again: a) filing income tax return, b) requesting passport, driver's license, birth certificate or other personal document, c) registration of a car or other vehicle	95%
Top of the web, 2004 [22]	EU-6	Overall evaluation of 20 basic public e-services [16] among its users (% of points 5-6, 1-4 excluded)	62%

2.3 Factors Influencing the Use of E-Government

The question is: why is the interest in e-government so high on the one hand, but its usage so low on the other. A lack of awareness may be one of the reasons. If people do not know that public e-services are there, they will not use them, even if those services have an added value for them [15], [21]. Furthermore, three main e-government adoption factors were shown to be linked to an increased intention to use them, due to [3]: perceived usefulness, relative advantage and compatibility. On the other hand, Leitner [14] assumed that "...people will be prepared to access government services online but only if doing so is quicker, easier and/or cheaper than going through conventional channels".

Moreover, Van Deursen et al. [24] stressed three factors that can be ascribed to low e-government usage: (1) geographical distances may encourage citizens to use e-government services; (2) successful multichannel approach that divert citizens from the web to call centres and service desks, and (3) variables such as quality and user friendliness of e-government services. According to some research (e.g. [5], [19])

among others, privacy and security concerns are also barriers to e-government use. On the other hand, the results of the surveys in Table 3 revealed that the most frequent barriers to use of e-government were a preference or need to contact 'traditional' government, low awareness of e-government and concerns about data security.

Table 3. Factors influencing the use of e-government

Research	Region	Indicator	Results (%)												
Berner Fachhochschule & Unisys, 2006 [1]	Switzerland	Weak points of communication to government via internet among citizens who have already used the internet for contact with government	not sure of misuse of data: 56 missing personal contact: 43 technical problems: 41 not feel very competent user of internet: 21 too complicated: 19												
eUser, 2005 [10]	EU-10	Barriers to e-government anticipated before use among respondents who generally have a need to get in touch with government and would like to do more e-government	must go to the office anyway to sign something: 58 for complex forms it is necessary to have face-to-face advice from staff: 54 concern on supplying personal data online: 45												
AGIMO, 2005 [2]	Australia	Reasons for not contacting government via the internet for a particular contact among respond. who have used internet in the last 12 months	was not aware can be done: 23 preferred to speak to/meet a real person: 11 concerns about security of information: 8												
MORI, 2004 [6]	English local authorities	Perceived disadvantages of e-communications (website) among respondents saying very/fairly unlikely to use council's website	prefer to make contact in person: 22 do not have access to e-channels: 20 don't understand the technology: 19												
Wangpi-patwong et al., 2005 [25]	Bangkok	Significance of barriers (1-5) for the adoption of e-government websites among respondents who have never experienced those websites	<table border="1"> <thead> <tr> <th>no information about which government website should be used</th> <th>mode</th> <th>amount (%)</th> </tr> </thead> <tbody> <tr> <td>no information about which service is available online</td> <td>3</td> <td>36</td> </tr> <tr> <td>no desired info. or forms</td> <td>3</td> <td>32</td> </tr> <tr> <td>insufficient instructions</td> <td>3</td> <td>41</td> </tr> </tbody> </table>	no information about which government website should be used	mode	amount (%)	no information about which service is available online	3	36	no desired info. or forms	3	32	insufficient instructions	3	41
no information about which government website should be used	mode	amount (%)													
no information about which service is available online	3	36													
no desired info. or forms	3	32													
insufficient instructions	3	41													

3 The Slovenian Case Study

The following section presents the results of our empirical study relating to the outlined hypotheses (for additional information refer to <http://www.iiu.si>).

3.1 Methodology

The study is based on a population telephone survey performed in July 2005 using the CATI method (Computer Assisted Telephone Interviewing) with a representative sample of n=1028 citizens aged 18 years or older. When interpreting the results, a 95% confidence interval should be taken into account.

The questionnaire comprised eight sets of questions. In addition to demographic questions, respondents were asked about their use of different basic information technologies, about their awareness, interest, usage and satisfaction with four different types of e-government supply, i.e. information, e-mail communication with civil servants, downloadable application forms, and public e-services. Some questions also

referred to general satisfaction and trust in e-government, future use and opinions regarding the future development of e-government.

3.2 Analysis of Results Related to Outlined Hypotheses

3.2.1 Gap Between Expressed Interests and Actual Use

The results of the survey indicate that general interest in e-government in Slovenia is really high, since 92% of internet users are very interested in using at least one type of e-government supply and only 4% of them were not interested at all (Fig. 1). However, a detailed view reveals significantly lower and different levels of strong or partial interest in individual types of e-government supply; from 87-95% in public e-services to 30-63% in communication with public servants via e-mail (Fig. 1).

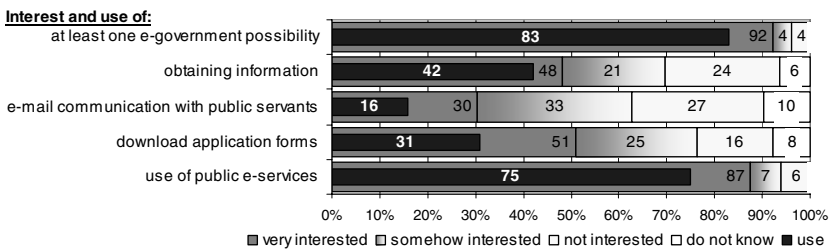


Fig. 1. Gap between interest in and usage of e-government among internet users (n=507)

Comparing the levels of interest with percentages of actual use reveals very wide gaps (Fig. 1), the widest being for communication with public servants via e-mail and downloading application forms and slightly narrower in obtaining information and use of public e-services. Note also that although the percentage of internet users who have already used e-services is relatively high, usage levels of individual e-services are quite lower and the range of e-services used is very small. There are only 12 e-services that had already been used (and only 7 that had been used by more than 1% of internet users). The most used e-services are library book search (50%), followed by job search (27%), filing an income tax declaration (26%), and ordering European health insurance card (24%).

3.2.2 User Satisfaction

The survey results indicate relative satisfaction with all types of e-government supply, since the mean (average values) of the answers for all criteria assessed on a scale from 1 (very unsatisfied) to 5 (very satisfied) exceed 3.7 (Fig. 2).

A more detailed review of the results shows that users are least satisfied with e-mail communication with public servants, and particularly with the speed of response, while the usefulness of the response only scores slightly better (with both criteria the users were less than satisfied). In assessing information, users were most critical with information completeness and ease of access, while the usefulness of information scored slightly better. The higher scores for the accessibility of application forms and e-services is, in our opinion, a consequence of the fact that most of them are available via the national government web portal. For public e-services the worst scoring

criterion was security/protection of privacy, while completeness of e-services only scored slightly better, which means that in general the existing e-services do not resolve the life events that users want. Interestingly, general satisfaction with e-government is considerably lower than satisfaction with individual possibilities; with trust scoring even lower (Fig. 2). However, trust among internet users that have not yet used e-government is even lower, which means that actual experience with e-government does contribute to increasing the level of trust.

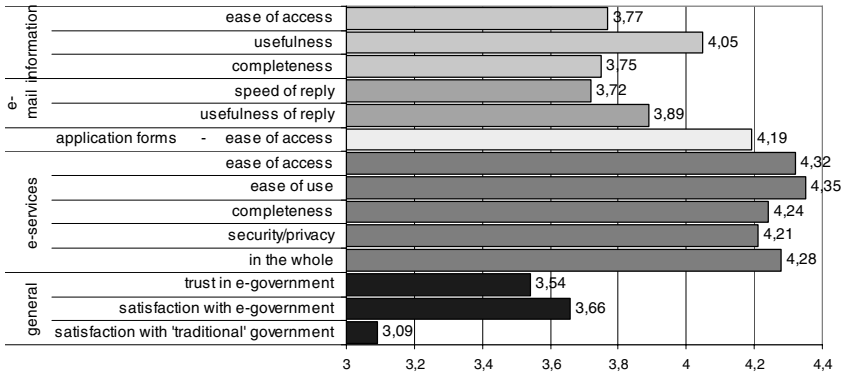


Fig. 2. Satisfaction with the use of individual types of e-government supply, trust in and satisfaction with e-government as a whole, as well as satisfaction with traditional government (n=210, 83, 159, 355, 421, 417, 417)

3.2.3 Factors Influencing the Use of E-Government

According to the survey, there are five main reasons for not using e-government, as indicated also in Fig. 3:

- *No internet use:* 51% of all respondents have not used it yet, while 42% have not used even a computer.
- *No interest:* in general, only 4% of internet users have no interest in using any type of e-government supply; however, many respondents that are interested in some types are not interested in other types of e-government. Thus, the proportions of uninterested respondents vary according to the type of e-government supply.

The next reasons for non-use concern internet users who are at least partially interested in using individual types of e-government, but that had not used them yet, thus explaining the gaps between the expressed interest and actual levels of use:

- *Lack of awareness:* although all internet users know at least one possibility of e-government supply as well as at least one public e-service, there are significant proportions of respondents not knowing other types of e-government.
- *Preferring to use traditional means* of dealing with government.
- *No need yet:* the most frequent reason for non-use among internet users, who are aware of a particular type of e-government supply. Nevertheless, it should be noted that in real life, people do not need to contact the public administration on a daily basis, but nobody can completely avoid it. Taking into account the fact that the

survey questions included no time limitations, we can suppose that even these respondents also prefer traditional ways of dealing with government, largely. As a result, the preference to use traditional means contributes most of all to the gap between interest and actual use. This is a kind of paradox, since respondents who expressed at least some interest in the use of e-government said that they had not actually used it because they prefer traditional means. Therefore, it is possible that there are other factors, which respondents have not revealed directly. One can guess that those factors include the need to contact 'traditional' government due to incomplete e-government supply, and the *added value* of e-government, which is obviously too slight to encourage current non-users to change their habits. This can also be demonstrated by the fact that only 36% of non-users are confident that they will start using e-government in the future.

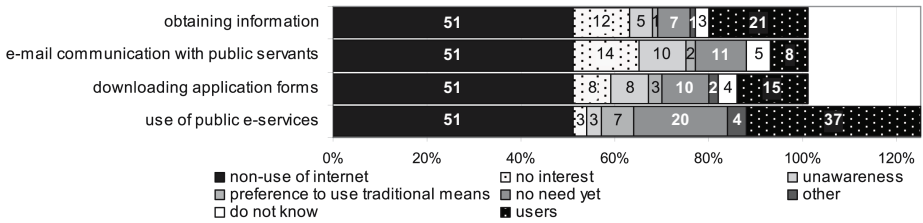


Fig. 3. Factors influencing the use of individual types of e-government supply according to all respondents (n=1028; note that sum of shares at public e-services exceeds 100%, because here each respondent gave answers for several e-services, thus percentages, which corresponds to the use and reasons of non-use refer to at least one e-service)

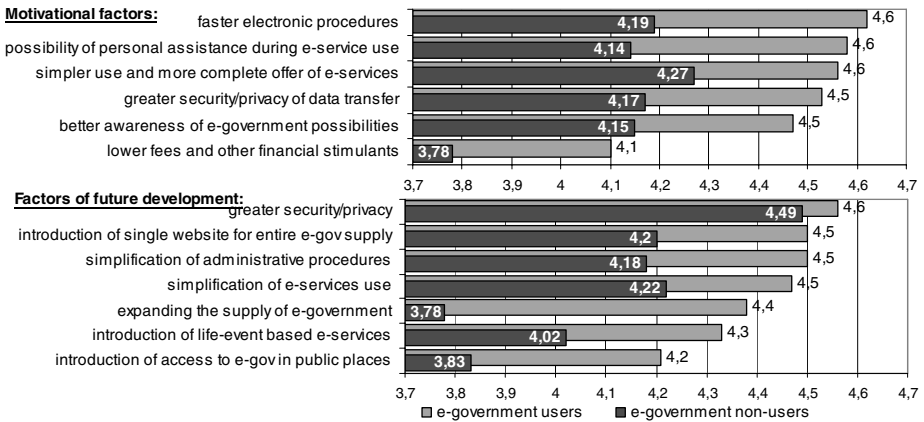


Fig. 4. The importance of individual motivational factors leading toward greater use of e-government and importance of individual factors for future development of e-government among e-government users (n=421) and among non-users, but internet users (n=85)

Moreover, e-government should provide more *added value* also for current users in order to convince them to use e-government in the future, since only 66% of current

users were certain they would continue to use e-government, while 30% were not so sure and 3% will certainly stop using it.

This added value clearly does not just mean the availability of public administration everywhere and every time, which are the natural benefits of the internet itself, but specific issues to be improved or taken into account in future development of e-government. In our survey, this added value was quantified by two questions regarding the importance of six motivational factors for future e-government use, and regarding the importance of seven factors for the future development of e-government. All factors were assessed on a scale from 1 (totally unimportant) to 5 (very important). The survey results indicate that both groups of factor are important, though more for existing e-government users and somewhat less for internet users that have not yet used e-government (Fig. 4).

4 What Can We Learn from the Users?

This section provides additional statistical analysis of the results of our study and then summarises the obtained results and compares them with the results of other studies.

In order to statistically test the presented findings and determine the real drivers of take-up and satisfaction with e-government in Slovenia, we also constructed a cause-and-effect model, shown in Fig. 5. The model uses a PLS method, which is one of the second-generation multivariate methods based on regression analysis (for details see [20]). Although inspired by some major existing theoretical models such as ACSI [11] and ECSI [4], this model was built on an empirical basis in order to select the factors with the greatest impact on the level of use of and satisfaction with e-government. Note, that the most influential factors are not necessarily those with the largest proportions or means, but factors which changes in scores have the largest impact on the levels of use and satisfaction with e-government. Comparing mean values and impacts (i.e. regression coefficients), it is then possible to find what components should be prioritised in order to effect an improvement. The results of the PLS analysis are presented in Fig. 5, while the prioritisation of elements is illustrated in Fig. 6.

To provide some recommendations for e-government decision-makers, in the following the results of our and other studies are summarized and compared with the initial hypotheses:

- All studies confirmed that *there is the gap between the expressed interest and actual usage of e-government*. Moreover, reasons for the gap are similar: lack of awareness, preference or necessity to use 'traditional' means of contact, and lack of added value. However, when talking about factors influencing the use of e-government in general, the non-use of internet and no interest should be added to this list. In order to rank these factors upon the strength of their effects on the use of e-government, the results of the PLS analysis should be taken into account (see Fig. 5). They demonstrate that non-use of internet is still by far the most important reason for the non-use of e-government, since it has the highest path coefficient. The negative sign of the path coefficient predicts the growth in e-government usage, when the number of internet non-users decreases. Other reasons for non-use have similar, although smaller, impacts.

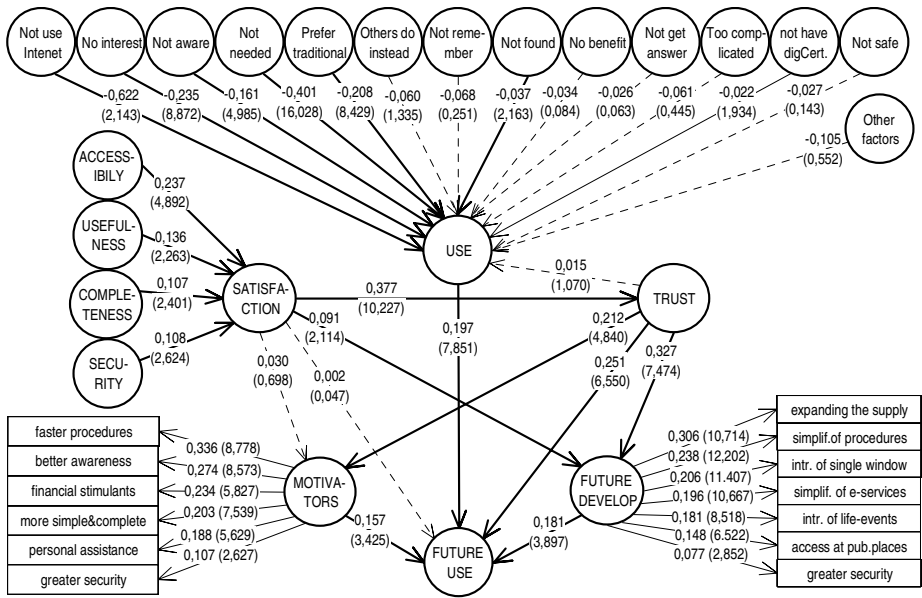


Fig. 5. Cause-and-effect model presenting factors impacting usage of and satisfaction with e-government (outer weights, path coefficients and t-values in parenthesis are coming from PLS algorithm and Bootstrapping within SmartPLS software tool [17]) – significant paths are presented as solid lines (t > 1.96 means significant impacts at 0,05 level)

- *There are three decisive factors influencing the use of e-services: added value, public awareness and trust, which have been proven by our and other studies. In description in section 3.2.3 as well as in Fig. 5 it can be seen that several value added factors (e.g. not needed, prefer traditional means, no interest) as well as public awareness have significant impacts on the use of e-government. Moreover, low level of trust and its great impact on the future use of e-government also prove the outlined hypothesis. However, looking at the different satisfaction factors, motivational factors and factors for future development of e-government that have also been observed in our study, information about what should be done in order to improve the situation can be identified. In Fig. 6 it can be seen that improvement in accessibility to e-government is the most influential factor in user satisfaction, since the mean value, (i.e. satisfaction) is low while impact is high. On the other hand, completeness of information and e-services is in fact poor, yet improvement will have little impact on satisfaction. Among usage motivators, top priority should be given to factors with the greatest mean values (i.e. importance) as well as the greatest impacts. These are faster procedures compared to ‘traditional’ ones and better awareness. On the other hand, the lessening of effort in the field of financial stimulants will have a negative impact. Regarding user requirements for future development of e-government, the main priority should be the simplification of administrative procedures, simplification of e-service use and the introduction of ‘a single window’ concept. On the other hand, the high impact, but relative low level*

of importance of extending the e-government supply means that lessening effort in this field will have a strong negative effect on user expectations.

- *User satisfaction surveys can only partially serve as guidelines for further development of e-government.* The results of PLS analysis reveal some interesting findings, which offer a different insight into the simple descriptive statistics presented in section 3 in the sense of extracting the factors that should have the highest priorities in the further development of e-government. This can be demonstrated on the example of security/privacy issues. Many studies, including ours, find security and privacy concerns as important barriers to e-government use; since this issue is assessed as very important motivational factor and the most important factor of future development of e-government (see Fig. 4). In addition, security/privacy was the worst scoring criterion of satisfaction with e-services (see Fig. 2). On the contrary, PLS analysis revealed that improvements in security issues would have the least effect on the satisfaction and future use of e-government among all assessed factors (see Fig. 6). Thus, we are convinced that the notion of low security is more likely the consequence of respondents' perceptions than a reflection of the current state or actual bad experience.

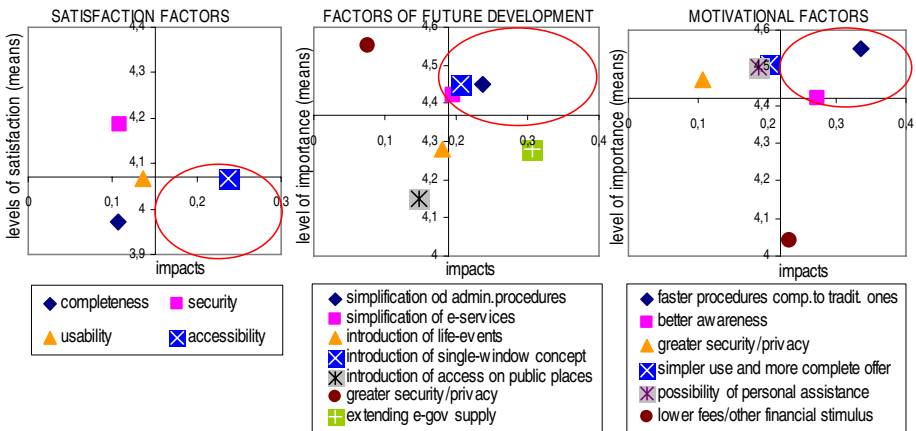


Fig. 6. Prioritisation of factors influencing user satisfaction, future development and future use of e-government (factors with the highest priorities are encircled)

5 Concluding Remarks

From the case presented above, one can see that it is not sufficient to use simple descriptive statistics when interpreting the results of user satisfaction surveys, and one must also calculate impact values (for example using PLS), in order to predict what factors are really significant in making future developments. However, additional research in determinants of e-government satisfaction and adoption should be performed in order to determine all important influencing factors and propose improvements in right directions. Remember what Eggers said [7]: “*The dark side of e-government isn't cost overruns, turf battles or integration issues; it's low adoption*”

rates. Without customers, the public sector can't justify large investments in e-government for much longer."

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An Ontology for the Multi-perspective Evaluation of Quality in E-Government Services

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Abstract. This paper presents a quality ontology that formalizes all the needed knowledge for the realization of a multi-perspective and adaptive evaluation of e-government services. Different perspectives are taken into account and the mappings between them are defined using the presented ontology, enabling a comprehensive and holistic view of quality. Based on the quality ontology presented, the evaluation can be organized in a way to serve every citizen individually, increasing the efficiency of e-government services' evaluation. The quality ontology can form the basis for the future construction of an ontology-based system which implements the customized and multi-perspective assessment of public e-services.

1 Introduction

As most of the public administrations in Europe and developed countries recognized the need of e-government services the number of online Government to citizen (G2C) and Government to Business (G2B) services has substantially increased. For example according to Cap Gemini Report [1] for the 20 basic public services in the EU, the number of official service providers present online has crossed the 90% threshold in the EU-15 plus Norway, Iceland and Switzerland ('EU-18').

Although the number of e-government services increases, manifold problems related to quality of public e-services still exist; see e.g. the Top of the Web survey [7]. Some of the frequently reported usability problems, for example include: not being able to find the needed service/information; difficult use of e-services; need for better help regarding the e-service provided on the website; language understandability; etc.[16]. The existence of these problems surfaces the need for a periodic measurement of the quality of existing e-government services, as the basis of a continuous improvement process. You cannot manage what you cannot measure and what is not tracked is not done [21]. This approach is also embodied in W. Edwards Deming's "Plan-Do-Check-Act" cycle [5] and in Juran's continuous improvement model [11].

In other words, we need to assess the quality level of the electronic services provided by public entities to citizens and business organizations. For the assessment of e-government services, like any other assessment, there are two major questions

that must be addressed (see for example, [13]): “What to assess?” and “What data will be used for the assessment?”.

In this paper we present a quality ontology that formalizes all the knowledge needed for the realization of a multi-perspective and adaptive evaluation of e-government services. Different perspectives are taken into account and the mappings between them are defined using the presented ontology, enabling a comprehensive and holistic view of e-government service quality.

The paper is structured in 5 sections. After this brief introduction, we present in section 2 an overview of our approach and the Quality of e-Government Services (QeGS) ontology in section 3. Related work is presented in section 4, while section 5 includes our conclusions and our recommendations for future work.

2 Overview of Our Approach

A quality model is responsible for providing answers to the aforementioned questions, concerning the assessment of e-government services as it allows:

- The specification of quality dimensions concerning the quality in e-government services provided by public administrations (the answer to the first major question)
- The definition of data sources that are going to be used for the assessment of each quality dimension or group of dimensions (the answer to the second major question).

Such a model enables an exact and comprehensive view of quality of e-government services, and thus will have significant impact on the improvement of online public services and on the increase of e-citizens satisfaction. Although the introduction of a Quality model for e-Government Services (QeGS) is the first step towards the improvement of public e-services’ quality, it is not enough.

Citizens pose different access possibilities, skills, expectations and motivation, thus they face different problems during their navigation to an e-government portal while searching for a public e-service or during the actual service provision. This variety in citizens’ skills, expectations and in problems they face has as consequence that each citizen has different perceptions concerning the quality of public e-services.

Another source of variation is the level of importance of each quality factor among users. For example for some users without web experience that are often lost in the information space of a portal, quality is related mostly with a clear and easy to follow portal structure, or the provision of help information related to the completion of submission forms. On the other hand experienced users put more emphasis on advanced features like automatic recalling of user’s personal data within portal’s submission forms or on some technical characteristics of the portal.

Considering the aforementioned variations, it is apparent that a “one fits all” e-government services’ assessment is not efficient. For example an experienced user must perform the evaluation without being bothered with irrelevant information. On the other hand an in depth examination of the various quality factors is needed by other groups of users that face problems. Besides citizens, an evaluation that is targeted to problems is very important also for the analysts, because such an approach supports them in the decision procedure about the planned actions for improvement.

For e-government services' assessment to be efficient, the evaluation should be organized in a way to serve every citizen individually. For the realization of such a customized and adaptive evaluation of e-government services, an intelligent, semantic-based platform is needed which allows each citizen to put emphasis in quality dimensions related with the problems she faces, depending on her skills and expectations. In that way quality assessment of e-government services will become more proactive offering more and better data that can be used as input for the support of decisions towards the improvement of services to citizens.

In order to enable formal specification and analysis of the quality model, all factors that influence quality as well as the relationships between them should be defined formally and explicitly. This formal model is captured in the Quality of e-Government Services (QeGS) ontology that formalizes all the needed knowledge for the realization of a multi-perspective adaptive evaluation of e-government services.

The evaluation is characterized as multi-perspective because we take into account different perspectives for a comprehensive view of quality. The citizens' point of view is very important as citizens are the final receivers of the services. However there are some technical aspects contributing to the overall quality of e-government services that most of citizens are not able to evaluate. Consider for example the quality aspects of transactions' security and the secure store of citizens' personal data. These are aspects related to quality factors of security and privacy but citizens are not aware of the technologies used in order to assure a secure and private experience. The service provider and especially employees that are involved in the operation of the e-government portal are more appropriate for the evaluation of these quality aspects.

Based on the above remarks and the related literature (see section 0) we have introduced a second perspective in our solution of the e-government services' evaluation problem, the service provider's one. The service provider can estimate the quality perceived by citizens or can assign the task of service evaluation to a group of experts in the e-government domain. Both citizens' and service provider's perspectives are subjective because they represent citizens' and technical employees' opinions, respectively.

Another very important perspective that we take into account in our overall solution, is the objective one. According to this perspective the quality is measured and monitored using specific metrics that are relevant for each quality factor, e.g. system up time is an important measure for system's reliability. The introduction of this third perspective enables an objective and un-contradictable view of quality.

The quality ontology enables the representation of quality parameters and metrics using a shared representation and the integration of assessments from the three different perspectives, described earlier. With this way the QeGS ontology offers a comprehensive and multi-perspective solution to the problem of evaluation of public e-services delivered through an e-government portal.

3 The QeGS Ontology

The QeGS ontology is three-layer ontology, consisting of 122 concepts, 50 properties and 160 restrictions. It is formalised using OWL [15], since it is a standard language for representing ontologies on the web. The ontology has been partially developed using open source ontology editor, namely Protégé [18] and has been successfully

checked for inconsistencies using the trial version of the Description Logic Reasoner RacerPro [19].

Each layer of the ontology is related with a different level of abstraction concerning the modeled concepts and relations between concepts. The top layer is the most abstract, the middle layer follows, while the third one is application specific and is strongly related with the particular e-government portal where the ontology will be integrated.

The aim of the top layer ontology is to define a minimal set of high level concepts and relations between them that are needed to describe the notion of quality of service. This layer concerns quality of service in general and models the theoretical foundations upon which the multi-perspective approach for quality evaluation of public e-services is based.

The middle layer ontology concerns quality of e-government services and models quality aspects related to e-government services. The third layer of our ontology, the bottom one, is domain-specific. The aim of this layer is to support the different configurations of each e-government portal's system. For example it is possible that some concepts of the middle layer ontology cannot be applied to a specific e-government portal. The bottom level ontology is responsible for the relevant configurations to the middle layer one, in order to support compatibility with each service provider's system. In the following sections we present the top and middle level ontologies.

3.1 The Top Layer QeGS Ontology

The aim of this ontology's layer is to define a minimal set of high level concepts and relations between them that are needed to describe the notion of quality of service and its multi-perspective nature. As described in the introduction, we take into account three different perspectives for the evaluation of e-government services' quality: the citizens', the service provider' and the objective metric-based perspectives. These different perspectives of quality have been stressed by well known researchers in the quality area, like Shewhart, Ishikawa and Parasuraman and form the theoretical foundations of our work.

As Walter Shewhart [20] introduced, quality could be described in terms of objective and subjective quality. Objective quality is the degree of compliance of a process or its outcome with a predetermined set of criteria, which are presumed essential to the ultimate value it provides. Subjective quality is the level of perceived value reported by the person who benefits from a process or its outcome.

Kaoru Ishikawa [10] developed an approach combining the customer's and the producer's view of quality. He named the customer's view as "true characteristics" and the producer's view as "substitute characteristics" and claimed that the degree of match between true and substitute ultimately determines customer satisfaction.

These approaches imply the need of tapping into opinions of different involved groups, achieving a 360 degree view. The term 360 degree originated in the commercial sector, and refers to "full circle" feedback from bosses, peers, and those junior to the person assessed [12]. This idea is very useful, as it provides a general direction concerning the methodology that should be used for assessment and can be applied in many domains. Using the idea of combination of different perspectives, coming from different data sources, we gain a multi-source assessment system that provides 360 degree feedback to the management of the public organization.

3.2 The Middle Layer QeGS Ontology

The middle layer QeGS ontology is based on a quality metrics system, which encapsulates all the quality aspects related to e-government services. This metric system has been developed as part of our previous work and allows the specification of quality dimensions, factors and constructs concerning the quality of e-services provided by public administrations [8]. Factors and dimensions are both quality aspects that affect the perceived by users quality, but they examine quality in a different level of detail. Quality factors focus on high level quality aspects such as the usability of the portal/web site, the quality of information, while quality dimensions examine in more detail the relevant quality factor. Relevant quality dimensions for the aforementioned quality factors are for example the web site's structure and appearance, for portal's usability quality factor and information accuracy and freshness for information quality factor.

Quality factors are categorized to quality constructs, in a way that each quality construct consists of one or more quality factors. Quality constructs are relevant with major quality areas affecting perceived quality, and are related with the way that an e-government portal is constructed. Examples of quality constructs are service quality construct, content quality construct and system quality construct.

There is a hierarchical relationship between constructs, factors and dimensions. Constructs are composed of quality factors, while factors consist of quality dimensions. Quality constructs, factors and dimensions as well as their hierarchical relationships are modeled with the middle layer ontology. We take advantage of these hierarchical relationships and their well defined semantics, for the specification of the adaptive quality evaluation by citizens.

Citizens' evaluation is performed using an adaptive questionnaire. Quality statements or questions addressing the citizens are structured into two levels. First level questions measure the quality in a high level of detail, while the second level questions examine in more detail the relevant first level questions. This means that for each first level question a set of relevant second level questions exist. Each factor affecting quality is related with a first level question, while each quality dimension is related with a second level question.

The public organization incorporates into its e-services portal the adaptive questionnaire. Data about users' interactions with the e-government portal, obtained from click streams, are collected into the web log. User click streams are analyzed and depending on some pre-specified criteria the adaptive questionnaire is dynamically composed. Incorporation of second level questions will occur when a user grades low a quality factor, to examine in more detail the problematic quality factor.

Another criterion that is used for the questionnaire adaptation refers to the problems that users face during their navigation in the e-government portal. These problems can be identified by a component that analyzes users click streams. Users are categorized according to the problems they face during their navigation and their online behavior. The idea here is that if a problem has been identified and the citizen is categorized into a specific user group along with other citizens facing similar problems, then only the second level questions that are related with this problem are presented to citizen. For example a navigation problem is related with navigation questions, so if a navigation problem has been identified for a citizen, only second level questions relevant with navigation are presented.

Another criterion used for the selection of questions that will be presented to a citizen, is the content of the pages that he has visited during the session. There are some questions of the citizen questionnaire that are related with specific parts of the portal. The majority of user sessions contain hits to a small portion of the portal's pages, so there is a high possibility that a user is asked about something that he hasn't met during his session. Examples of questions related with specific portal's parts, are questions concerning forms used for submission of information, and questions regarding support mechanisms. These questions are presented only in case of a user session that includes forms, or the FAQ page or the page with contact information, as long as these pages are used primarily for form submission or the initiation of the support process. For the categorization of portal's pages to the various page types, the web pages can be annotated with semantic information.

Independently of the criterion that is used in order to decide which questions to incorporate into the adaptive questionnaire, the quality ontology is used for the questionnaire adaptation. Except of quality constructs, factors and dimensions and first and second level questions, the middle layer quality ontology models the different "actors" that represent the three different perspectives defined in the top layer one, i.e. citizens, technical staff of the public organization and system metrics. Finally the demographics of each citizen are modeled, because this information is very valuable for the analysis of their responses.

The major relationships between the concepts of the middle layer ontology are depicted in the figure 2. A quality construct has one or more quality factors. Quality factors can be assessed either subjectively (by citizens, service provider or experts) or can be measured by using metrics obtained from web log and workflow log. Therefore there are two major categories of quality factors: *AssessableFactors* and *SystemPerformanceFactor*. Each Quality factor is subsequently decomposed into its relevant quality dimensions and has a relevant first level question. The hierarchical relation between first and second level questions is represented by the object property *hasCorrespondingSecondLevelQuestion*. The concept of quality assessment has been modeled with the *Assessment* class. Each assessment is performed by citizens or technical staff.

3.3 The Role of QeGS Ontology

The role of the QeGS ontology is:

1. To enable the adaptivity and the customization of citizens' evaluation. The QeGS ontology models formally all factors and quality dimensions that affect the perceived by citizens quality during the e-government service provision. It targets specifically the relationships between "pieces" of domain knowledge, explaining how they contribute altogether to the overall quality. This knowledge is used in order to enable the dynamic composition of the presented questions that are used in order to obtain adaptively the citizens' feedback.

Ontology-based queries can be used for the match making between quality factors, dimensions and questions during adaptive questionnaire execution. For example, when a user rates low a first level question of the adaptive questionnaire, the ontology is queried to find out the relevant second level questions for the problematic first level question. In order to enable the adaptation process described above, questionnaire data and answers are stored

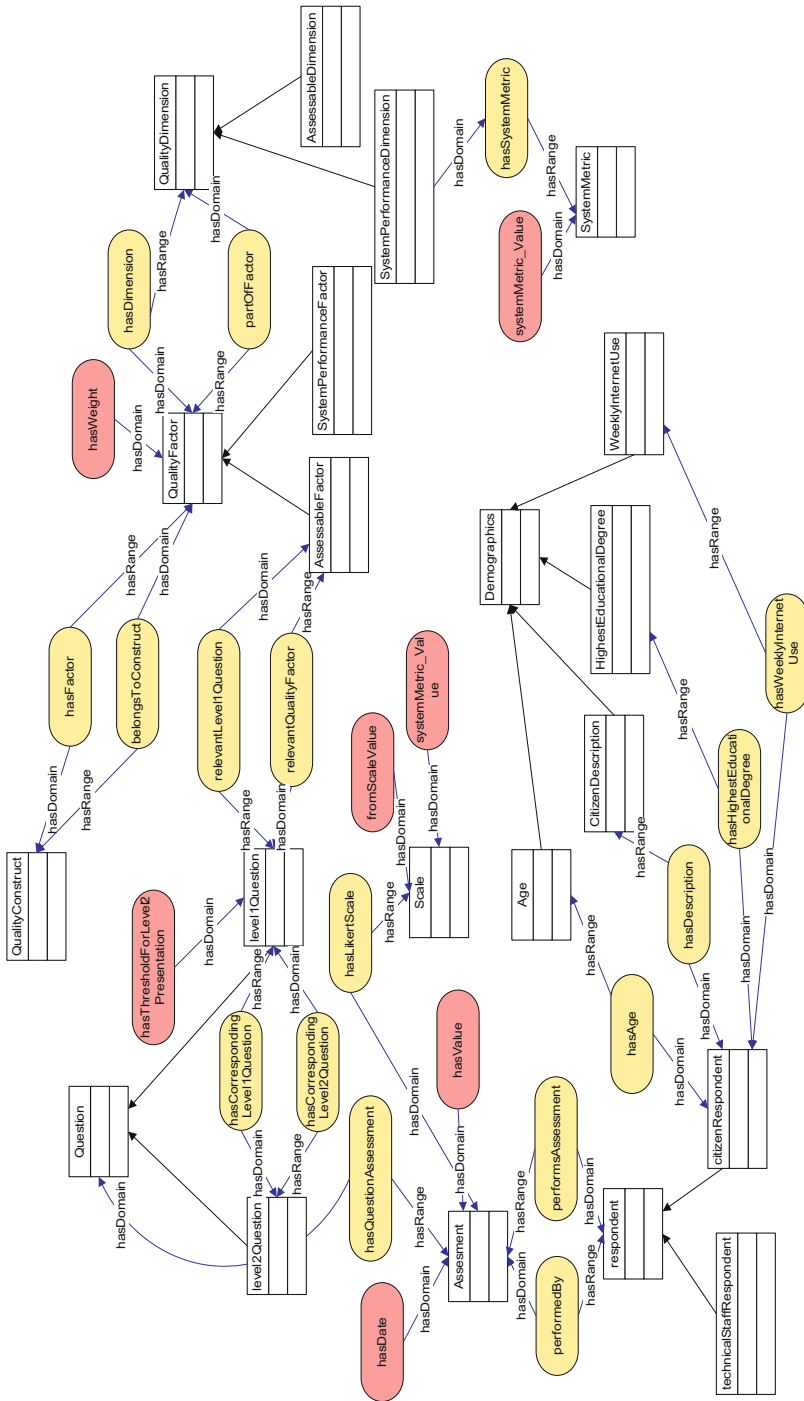


Fig. 2. Major concepts and properties of the middle layer QeGS ontology

as concept’s instances and the corresponding data/object properties of the QeGS ontology.

Another criterion that is used for the adaptation of the questionnaire is the problems that the user faces during the navigation on the portal. If a problem has been identified from the click streams analysis, then only the second level questions that are related with this problem are presented. The combined use of QeGS Ontology together with a problems ontology that models users’ problems is necessary in order to enable this type of problem-based adaptation. Concerning the content based adaptation of the questionnaire some questions are presented only in case the user has visited some specific types of pages. Combined queries to QeGS ontology and content ontology which models the content of portal’s pages, must be used for that.

2. To enable the integration of the three different perspectives taken into account for the evaluation of e-government services. For each quality factor and dimension the QeGS ontology contains machine-readable information about its assessments by citizens and technical staff and about the objective measures that are related with this quality factor. The integration of this different information into a single ontology, enables a valuable combination and a holistic view of quality of e-government services.
3. To enable better communication (human to human). By defining a common-agreed vocabulary, the QeGS ontology ensures shared meaning regarding quality of e-government services and supports better collaboration between various tasks of the assessment procedure.
4. To enable sharing and benchmarking of knowledge regarding quality assessment gathered/learned in a web portal in other portals. By representing knowledge about quality of e-government services conceptually, in a machine-readable form, it is possible to distribute this knowledge without lost of its usability. It means that there will be possible to compare the quality assessments of a specific e-government portal, with the assessments of a second one. So, the ontology can serve as an enabler of benchmarking.

Figure 3 illustrates the major goals of the QeGS Ontology:

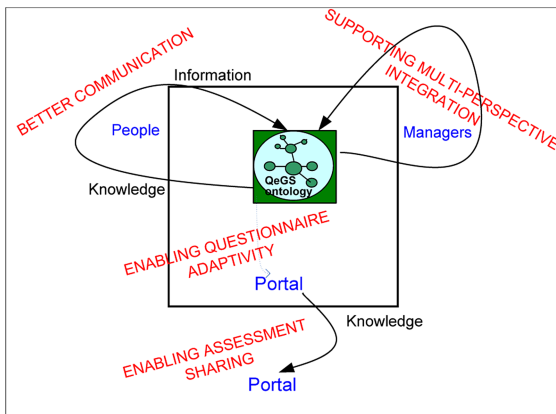


Fig. 3. Goals of QeGS ontology

4 Related Work

There are several ontologies in literature that are explicitly called QoS ontologies. The e-GovQoS, an Ontology for Quality of e-Government Services [4] takes into consideration dynamic aspects related to Quality of Services and their impact in the service composition, in particular when a large number of services are available to reach the same goal. The role of this Ontology is service discovery and composition based on their QoS characteristics. The emphasis is put on quality of web-services and low level quality metrics are mainly modeled.

A similar to e-GovQoS ontology is the one developed in Lancaster University [6]. This ontology has been named QoSOnt, an ontology for Quality of Service and its role is service discovery and selection based upon QoS requirements. QoSOnt supports network and services as the type of system that QoS may refer to and the focus is given to its application in the field of service-centric systems.

Service discovery and composition is also the main role of the quality taxonomy developed in [2]. This taxonomy defines the quality characteristics of networks, channels of communication and access devices that can be used for the delivery of services and describes quality elements of a multichannel environment.

An ontology for the specification of QoS metrics for tasks and Web services has been developed in [3]. The information formalized in the ontology allows the discovery of Web services based on operational metrics. The focus of this quality ontology is put on quality dimensions of time, cost and reliability.

All these ontologies focus on quality characteristics of web services that must be taken into account for a QoS-based service discovery and composition. They don't take into account neither quality characteristics related to user interaction with the portal nor service provider's perception about the provided e-government services. Their role is to enable a quality-aware service discovery, something that is meaningful only in case that are a large number of web-services are available to reach the same goal and quality is used as a criterion for their selection. However, they cannot be used for the subjective evaluation of a single public e-service and thus for a holistic and high level assessment of quality. Our work seeks to address these gaps by providing an openly available quality ontology that enables a multi-perspective and adaptive assessment of public e-services.

The literature has been proved poor in the area of top level quality ontologies. Two of the well-known ontologies that are built specifically with the purpose of being formal top-level ontologies are the Suggested Upper Merged Ontology (SUMO) [14] and DOLCE [9]. SUMO is an effort by the IEEE Standard Upper Ontology Working Group aimed at developing "a standard upper ontology". The SUMO ontology defines high level concepts as object, process, quantity, relation, but unfortunately the concept of quality is not defined. Similarly, the DOLCE ontology which is a formal foundational ontology developed as a top-level ontology in the WonderWeb project, doesn't contain high level concepts related to the notion of quality. We fill this gap with the introduction of an upper level ontology which formalizes explicitly high level quality concepts and the notion of quality, the top level QeGS ontology.

5 Conclusions and Future Work

Quality evaluation is very important for the improvement of citizens' satisfaction about public e-services. For the level of satisfaction to be increased the actual perceptions must be measured. Various approaches in the literature have tried to address the issue of quality evaluation of e-government services. These approaches cover the assessment of many different quality factors that contribute to the overall quality. Their major disadvantage is that they do not take into account the perspectives of the different "actors" involved in the service provision, i.e. the service provider, the citizen and the system. Furthermore they follow a static and "one fits all" methodology for the assessment of services by citizens.

The quality ontology presented in this paper enables the mapping of assessments performed by each one of the three "actors" representing the three different perspectives, thus offers a 360 degree assessment of quality. Furthermore it formalizes the knowledge needed for the realization of an adaptive approach, where each citizen is been handled individually.

Future work consists of the development of an ontology based system, which uses the QeGS ontology and provides the functionality of the adaptive evaluation and of the mapping of different data sources that are used for quality evaluation. This system will be pilot-tested in eGov portals of Greece, Serbia and Austria, and the results will be analyzed in order to provide feedback to the management of these public administrations.

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Towards a Network Government? A Critical Analysis of Current Assessment Methods for E-Government

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Abstract. Contemporary public administrations have become increasingly more complex, having to coordinate actions with emerging actors in the public and the private spheres. In this scenario the modern ICTs have begun to be seen as an ideal vehicle to resolve some of the problems of public administration. We argue that there is a clear need to explore the extent to which public administrations are undergoing a process of transformation towards a network government linked to the systematic incorporation of ICTs in their basic activities. Through critically analysing a selection of e-government evaluation reports, we conclude that research should be carried out if we are to build a solid government assessment framework based on network-like organisation characteristics.

1 Introduction

According to network society theorists [10] social structures and activities are increasingly organised around network forms, largely grounded in electronically based information and communication technologies. If large private companies and social movements are inventing and becoming part of this new society, governments are apparently lagging behind in understanding this new logic, living still in the old hierarchical structure, or adventuring in losing some of their traditional characteristics through New Public Management policies. Contemporary public administrations have become increasingly more complex, having to coordinate actions with emerging actors in the public sphere, such as non profit organisations and the private sector; thus the silo like, inward-looking culture, slow decision-making and knowledge diffusion [29] of the old bureaucratic model seem to be ill-suited to improve flows of information and cooperation, levels of legitimacy and trust as perceived by citizens, and ultimately efficiency and efficacy.

In this scenario the modern information and communication microelectronic technologies (ICTs) have, since the middle of the 1990s, begun to be seen as an

ideal vehicle to resolve some of the problems of contemporary public administration. The usual argument is that the intensive use of technology could transform the operating rules of the public administration to increase its efficiency, simplify administrative procedures [16], expand the processes of citizen participation [19] and make the activity of governments more transparent and accountable.

In the context of these high expectations there is a clear need to explore the extent to which public administrations are undergoing a process of transformation linked to the systematic incorporation of ICTs in their basic activities. It is particularly interesting to verify whether there is a transition towards a new form of network organisation at the core of the public administrations that might be conceptualised as a virtual state [18] or, as a network administration [11] [4].

Our second concern is of normative interest and focuses on the evaluation models that have been applied to electronic government and their effects on policy making. High ranked characteristics by comparative research and evaluation reports, largely developed by big consulting companies, may have an influential role on governments' policies, with some ultimately adapting their strategies to score high in the comparative rankings of those reports.

Through reviewing a selection of evaluation methodologies, this paper aims at identifying, where they exist, research and evaluation methods and indicators that are concerned about the possible transformations of public administration towards a network government. The paper is organised as follows: the first part briefly clarifies our use of the concept "network government"; it follows with an introduction to the state of the art of evaluation reports on e-government and their general characteristics; it then analyses a selection of five research and reports and tries to identify indicators that could assess a network administration. It concludes with a synthesis of the main findings and points towards topics for future research.

It should be noticed that instead of the traditional analytical model of the social or organisational impact of technology - dominant in greater part of the literature on e-government - we opt for a constructivist analytical perspective [7] [21] that emphasises the two-way process of interaction between technological innovations and the specific social contexts (institutional, organisational and cultural) where these are designed or adopted. Therefore, we consider that the public administrations are not merely passive receivers where technology is consumed and used. Instead, their regulations, processes and own organisational forms play an active and determinant role in the final configuration of the ICTs and are, at the same time, transformed in the process of incorporating the technology - a type of phenomenon that has recently been considered by technology-in-practice concepts [27], in the general context of organisational theory and by technology enactment [18] in the area of research on e-government.

2 Network Administration

The concept of 'network administration' is closely related to the network structure identified by several authors [10] [28] in order to characterise the new social morphology of the informational society, where more and more social dimensions

structure their relations and activities in networks. Economic activity in general adopted this organisational form as a strategy to provide a response to the crisis of capitalism in the 1970s. Financial markets are now structured as a network of flows of information and capital that occur for the first time in history in real time and on a global scale. Companies increasingly incorporate the network model to restructure their core activities as the sole means of surviving in the context of globalisation.

Some authors have written on policy networks, network governance [24], public-sector organisational networks assessment [25] and on network organisation in the organisational science field [28] [31]. In general, however, we are in accordance with Dunleavy et al [14], that the role of ICTs has been generally marginalised or simply neglected in public management theory and public administration literature. From the political science perspective, when technology is remembered, it is either as a) a simple tool available out of the shelf or b) in a deterministic way (computer impacts/effects on). From the organisational point of view, technology has been dealt with more often, but in general with the above mentioned “naïf” view, with a notable exception of Orłowski [27]. Even the usual accounts of the Weberian ideal type of bureaucracy tend to forget the essential role Max Weber attributed to the technical paper-based system of information processing used by this kind of corporations. Thus, what concerns us in this paper is to take into account the role of the intensive use of ICTs in this transformation process of public sector operations.

Castells [10] [9] stresses that the phenomenon of the network structure that characterises the information and communication society is aided by, although not a simple consequence of, the intensive use of ICTs. He elaborates on how businesses and the economy in the globalised world operate nowadays, pointing out to important characteristics of this new organisational form, such as the organisation of activities around projects (of limited duration), the flexibility in reconfiguring to complete them, the internal decentralisation and cooperation with other companies (with the proliferation of alliances and connections between networks), affecting the core operations of the business activity [9]. However, the question that arises is “what about governments?”

By way of analogy, the network administration could be conceptualised as an organisational form characterised not only by the connection and level of interoperation between the information systems and the management procedures but also by a tendency to change the operation of the organisation towards more flexible management, more adaptable to changes and with relationships that are more horizontal than those which predominate in the traditional administration. Finally, it could be associated with the concept of modern governance [23], which refers to a more distributed and relational manner of governing than that found in the old hierarchical model [28], involving the direct cooperation between public and private actors in the public networks. However, our objective is not, and we believe this would not be a very useful approach, to elaborate on detailed characteristics of an ideal type of network administration and verify its existence in governments, but yet to seek understanding about whether these kind of

transformations are occurring, particularly with the intensive use of ICTs, and what forms they take.

Finally, we might ask why “measure” whether governments are transitioning towards a new form of organisation with the innovative use of ICTs. ICT implementation in governments does not necessarily represent an immediate vast reduction in costs running the government, as this requires investment in major projects, which often experience substantial cost overruns [8]; also, studies in the private sector show that ICTs not necessarily increase productivity of office work [26]. But at the organisational level, the picture might look different, as research demonstrates that the intensive use of ICT is positively linked to firm performance and results; case studies show that some organisations have been able to derive benefits through IT (e.g. Wal-Mart, Dell Computers, Charles Schwab) [26]. There are obviously contextual differences that shapes the way ICTs are managed and embedded in the public and the private sectors, but we find essential to question if similar transformations are taking place and to what extent in public administrations.

3 E-Government Evaluation

The issue of e-government evaluation has developed almost concomitantly with the development of the concept of e-government, which has been broadly defined as the extensive use of information and communication technologies by public sector organizations applied to a full range of government functions [20] [22] [17]. The use of ICTs in government structures is not new, but the concept of e-government became widely used in late 1990s when it became a policy strategy that focused on improving service delivery. Evaluation studies on the issue have been largely focused, although not exclusively, on the availability of web portals offering online services and their sophistication. Broadly speaking, we can identify in existing research and evaluation reports on e-government four clusters of topics [15] [20]: e-readiness (technological and human infrastructure, political support), supply-side (front office: number, types and sophistication of services available online; back office), demand side (take-up, user satisfaction) and impacts (financial and non-financial benefits). First studies asked whether services were online and, later, their level of sophistication [12] [3] [2] [1]. In the last years, some evaluators have shifted their concern from the simplistic availability of web portals and services, while still evaluating them, to other issues, such as cost-effectiveness of online services and the generation of public value [2] [1] [15]. More recently some attention has been given to the demand side: what is the actual use of the existing online services? Are “customers’” needs being met? [1]. Heeks [20] points out that we are supposedly entering the phase of evaluating outcomes and impacts. In parallel, the UN [30], exploring the interlinkages between e-government and development, has been looking at the readiness of a country to take advantages of the potential of the implementation of ICTs in the government as well as each government’s willingness to promote participation and include its population in the network society.

Some researchers, however, agree that the existing eGovernment evaluation and benchmarking methodologies do not support a comprehensive and policy relevant assessment of eGovernment [22][20], as they have been too narrowly focused on services delivery and very little attention has been given to the relationship between back-office of processes and organisational structure and the intensive use of ICTs. Current e-government research and evaluation methodologies do not easily capture transitional processes towards a network administration because they mostly focus on the availability of the structure (e.g. availability of online services and forums) of a digital government, and not on its dynamics. An exclusive look at front-office results may cause a kind of theoretical mirage: analysing brand-new virtual agencies may give the false impression that the rest of the organisation has already undergone a deep transformation process. The question is - are departments working towards a more collaboratively, relational, networked model of government, moving away from the “silo-like” model? And to what extent is this trend based on ICT innovative uses?

The use of ICTs in all spheres of government may be the (late and slow) development of the operational structure characteristic of the network society inside the public sector. Therefore, the idea of e-government developed in this paper embraces more than e-service delivery, e-democracy, and all the other “e”s. Web analysis is useful, but not comprehensive if we are to verify whether public administrations are being transformed in the direction of a new model of government.

4 The Missing Network Government Indicators

In this section we aim to identify on selected e-government research and assessment reports their understanding of e-government and whether there are indicators of transformations towards a network government. It is not within the scope of this paper to analyse all published research on the issue: we have chosen five for their importance in terms of perceived policy making influence and for representing perspectives from varied sectors. We do not intend to have a statistically significant sample, but yet - as we understand that there is lack of analysis of transformations in public administrations with the innovative use of ICTs - to indicate a different perspective to analyse the existent research and evaluation methods, and search for indicators that aim at understanding and measuring these transformations. Further research needs to be carried out if we are to form a more solid framework for network government “measurement”.

It is important to remark that none of the studied reports claims to be all comprehensive about e-government - but they also rarely clearly define what exactly they are evaluating, each using the term “e-government” as a general self-explanatory concept that usually involves the use of portals for online service delivery.

The University of Brown’s “Global e-Government 2006 Report” [32], widely cited in Latin America together with UN’s eGovernment readiness report, have been ranking for the last six years 198 nations on eGovernment development based on website analysis. National websites are evaluated for the

presence of various features dealing with information availability, service delivery, and public access [32]. Among those features are online database, non-native languages translation, user payments, disability access, number of public services fully online, website personalisation and others. In terms of “security and privacy”, for example, what is analysed is only the online information given about them, not their actual structure and characteristics. The analysis of “public outreach” follows the same pattern, where binary (yes/no) evaluation lies on the tools available for citizen’s participation, e.g.: e-mail addresses, comments area (message boards, chat rooms, etc), but no investigation is done on the uptake or the outcomes stemming from the availability of these tools.

Clearly, it is a report that roughly evaluates the quality of the website and the number of services online, but not concerned with any indicators of uptake, impacts, outcomes, or any internal and external transformation of the administration. However, although it offers nothing more than a very static evaluation of government’s portal, it is a widely cited and influential report in some developing countries, which only reinforces our concern about the need for developing research and indicators about real transformations in the public administration with the use of ICTs. Or else, we will continue to see “fully available online services”, however designed to be nearly as complex as their paper-based analogues [16], showing a simple transfer from the offline disorganised logic to the web.

Cap Gemini’s 2006 “Online Availability of Public Services: How is Europe Progressing?” shows more sophistication and concern about transformational issues, but ultimately it is a web based survey on electronic public services. It is the 6th benchmarking exercise on the progress of online public services in Europe. “[T]he main objective of the study (...) is enabling participating countries to analyse progress in the field of eGovernment and to compare performance within and between countries” [12].

The report ranks 28 European countries according to the number of services available online and the online sophistication of 20 basic public services, ranging from “basic” information provision over one-way and two-way interaction to “full” electronic case handling. The results are grouped in terms of target groups (citizens and businesses) and also combined in clusters: income-generating cluster (i.e. taxes and social contribution), registration cluster, returns cluster (public services given to citizens and business in return of taxes and contributions, e.g.: health related services, job search services) and permits and licenses cluster. Those services scoring stage 4 or full transactional level were also qualitatively assessed (“best practices”) on aspects like multi-channel delivery, mediation and support, proactivity, service integration, tracking and tracing and accessibility, which indicate some transformations towards a networked government. For example, the case of tax declaration in Sweden - where most taxpayers receive a pre-filled and pre-calculated version of their tax return, which can be filled online or simply confirmed by using the Tax Board’s telephone service or via SMS [12] - demonstrate a concern about transformations enabled by ICTs towards a flexible, innovative and efficient administration. However, these good practices are not translated into indicators and thus are not taken into account for the final score.

Although advancing in the analysis of online availability of services and exploring some best cases, it is in fact a report that analyses only the structure of the public administration on the web, not the “performance” as it is stated in their objectives, nor any transformations within the public administration. Cap Gemini partially acknowledges that, stating that this measurement framework was developed at a time when implementing e-government was still primarily about bringing public services online, and pointing out to other commissioned studies for the i2010 European Commission Action Plan that tackle take up and impact issues, such as LOT2, that tries to extract some common indicators concerning accessibility and user centricity from existing national standards and guidelines, and eGEP’s indicators of impact on supply, organisational and use indicators.

Accenture’s eGovernment “league tables” are one of the most cited in the world [1]. The last year a ranking was presented was 2005, the reason being that there has not been much progress in the last 3 years. Thus in 2006 they opted for interviewing senior executives of the highest ranked administrations in the previous report in order to extract best practices in “leadership”; the rankings will resume in 2007.

Accenture uses two measures to determine the e-government “maturity” (and ranking) of the 22 countries in the research: “service maturity” and “customer relationship management”, where 50% of weighting is allocated to service maturity and 50% to customer relationship management [2]. Service maturity is the product of service maturity breadth (number of services available) and service maturity depth, categorised in three increasing levels - publish, interact and transact - whereas customer relationship management refers to the extent to which government agencies manage interactions with their “customers” and deliver service in an integrated way. Customer relationship management in the 2005 Accenture model evaluates citizen-centred interactions (levels: program-centric customer experience, customer group segmentation, individual segmentation and intelligent interaction), cross-government service interaction (basic interaction, intra-agency interaction, cross-agency interaction and cross-government interaction), multi-channel service delivery (basic access, multi-channel experience and citizen data capture, channel synchronisation and case management and seamless service delivery) and proactive communication and education about available services (program offerings, proactive service offerings, targeted offerings and mutual value offerings). In 2004, they introduced a new survey component to the assessment of number and maturity of services, a quantitative survey of citizens’ attitudes and practices related to eGovernment in 12 countries. However the results were not taken into consideration for the ranking.

If evaluating online “service maturity” reproduces the same evaluation scheme of only looking at the structure of a digitalised government, “customer relationship management” does try to take one step further in understanding some aspects of the transformations of public administration. However, it does so indirectly, as it evaluates issues as horizontal and vertical integration only superficially through web analysis. As transformations in public administration,

rather than occurring at “internet speed”, seem to change much slowly, which is significantly attributable to the complexities of government bureaucracies and their tasks as well to the importance of related governance questions, it is not strange that Accenture has not seen much improvement in service delivery in recent years, as it looks mainly at front office applications and services availability, and ultimately neglects any process of transformation by which systems come to be embedded in administrations [16].

The UN “**Global e-Government Readiness Report 2005 - From e-Government to e-Inclusion**” [30] explores fields not mentioned above, such as a country’s infrastructure and human capital readiness for absorbing the potentials of electronic government, aiming at exploring the interlinkages between e-Government and development. It presents an assessment and two rankings of the 191 member states of the UN according to their state of e-Government readiness and the extent of eParticipation.

The readiness assessment measures the capacity and willingness of countries to use e-Government for ICT-led development. It is a weighted average composite index based on website assessment of services (quantity and sophistication), telecommunication infrastructure (society’s, not government’s) and human resource endowment (educational levels). The eParticipation index is a qualitative assessment of the websites based on the relevancy of participatory and democratic services available. It may be biased, as they in fact acknowledge, and it does neither evaluate participation, nor impacts and outcomes.

Some interesting points in UN’s methodology should be noted. It also uses web analysis as its main tool for assessing e-government but it also adds useful indicators to its evaluation methodology. Besides website assessment - that serves to measure, as they put it, the readiness of governments to offer online services - it also focus on society’s readiness to take full advantage of the potentials brought by the introduction of ICTs in public administrations, by measuring society’s ICT infrastructure and educational levels. However it does not look at the dynamic transformations stemming from the interaction of the availability of infrastructure (both society’s and businesses), human capital endowment, and online services. Are these actors working in a network? What are the outcomes in terms of flexibility, innovation, responsiveness, transparency, accountability, participation in decision making? That would be a very instigating follow up to this research. However we do notice some concern towards these issues, as seen, for example, in the last stage of service maturity - “networked presence”; it goes beyond the level of “online transaction” and it is characterised by the web integration of G2G, G2C and C2G (and reverse) interaction. Nevertheless, as with what we noted regarding the customer relationship maturity in Accenture’s model, UN’s model at stage five of service delivery - “networked presence” - only indirectly assesses, and implicitly assumes, integration of public sector agencies with full cooperation. This is indeed one good indicator of the willingness of a public administration to work in network, but does not in fact measure it, nor it is a direct account of its impacts and outcomes.

Last in this selection comes the eGovernment Economics Project (eGEP) [15]. The project developed a measurement framework based on existing impact

measurement models (Danish “eGovernment Signposts”, French “Mareva” Methodology, German “Wibi 4.0” Guidelines, UK “Business Case” Methodology and UK Criminal Justice IT Methodology), aggregating in its final full template 92 indicators built around three value drivers: efficiency, democracy and effectiveness. These value drivers stand for:

- Efficiency (Financial and Organisational Value): cashable financial gains, better empowered employees, better organisational and IT architectures.
- Democracy (Political Value): openness, transparency and accountability, participation.
- Effectiveness (Constituency Value): reduced administrative burden, increased user value and satisfaction, more inclusive public services.

eGEP takes a different and more fruitful approach, focusing on performance, impacts and outcomes. It sees the troubles with measuring only online services as “e-Government is not simply a service delivery channel but also a catalyst for organisational innovation and rationalisation, as well as for human resources revitalisation and empowerment. Besides increasing speed and accuracy, it contributes to radically change how governments go about their business as usual, including long ingrained cultural attitudes toward service delivery.” [15]. It presents still a very instrumental and “salvationist” view of e-Government and ICTs, but in contrast with the other methodologies, it states the aims and values of e-government and tries to build a framework of indicators that do not automatically assume that outcomes will occur (e.g.: accountability, efficiency) only from the presence of online services.

As this is an economics-based model, the indicators of financial efficiency are given prominence, which are indeed more direct and measurable, while indicators for democracy and effectiveness are mostly self-assessment and do not truly analyse transformations (e.g.: under “democracy” indicators, one indicator of participation is the availability of online channels for citizen interaction, which does not in fact verify transformations towards more participatory decision-making).

This framework shows concern about understanding the transformations in the direction of a new form of government, for instance, that is more efficient through the use of ICTs: indicators such as the “percentage change of case handled per processing full time equivalent”, the “percentage change in the number of transactions performed online” and the “percentage change in volume of document exchange digitally within public private partnerships” indicate monetised and time economies and integration with other non-public actors of society. However, looking deeper at the nature of these indicators, we notice transformations that may not be captured or perhaps even hidden by them: at first sight, having more transactions performed online, or more digital transactions with partners, is a good indicator of more efficiency in terms of paper used, time spent by citizens queuing, etc., but on the other hand, it may hide the very fact that if reengineering of processes and working methods were to take place, such transactions might be considered redundant and fully ceased to exist. We give this example to point out that ICTs simply attached and enforced into an old traditional and hierarchical model of government may in fact cause more burden

and increase complexities, therefore research of the transformations governments might be undergoing should also take this into account.

5 Conclusions

The old bureaucratic model of government is seen as increasingly ill fit to deal with the emerging complexities that contemporary public administrations have been facing. In the current scenario, where the Weberian hierarchical organisational model and the New Public Management policies have failed to fulfil their expectations, there have been high expectations towards the incorporation of ICTs to resolve some of those problems. Thus, there is a clear need to explore the extent to which public administrations are undergoing a process of transformation towards network governance linked to the systematic incorporation of ICTs in their basic activities.

The issue of e-Government research and assessment has had increased importance in the last five years as governments had to justify their spending in ICTs and verify whether improvements have indeed been made. However assessment have been mainly reflecting the instrumental view of e-government as a “policy strategy” for improved public service delivery; therefore they have largely focused, although not exclusively, on the availability and sophistication of web portals and online services. The question we ask is “are public administrations only transferring the offline bureaucratic model to the web or, are they really experiencing a transition towards a new form of government?”

Through the critical review of four e-government assessment reports and one evaluation framework we sought to indicate a different perspective of analysis and look for indicators concerned at understanding and measuring the transformations governments might be undergoing with the intensive use of ICTs. We hold the view, corroborated by the above mentioned analysis, that ICTs have been largely neglected in public administration and public management, and when mentioned, they are often considered as a simple tool that can be taken out of the shelf, or else seen in a deterministic fashion. These views extend to e-government assessment: attention falls mostly into front office applications and the availability of online services, which cannot fully capture the essence of the possible transformations towards a network-like organisation. Furthermore, the availability of a digital structure for government delivery of services is taken for outcomes of e-government; whether public administrations are more flexible, more responsive, more accountable or permeable to citizen’s participation can be hardly inferred from the existing indicators.

Although predominately focused on the analysis of government portals, some concern is shown regarding a network form of governance emerging from the embedeness of ICTs in public administrations, as seen by the indicators of “customer relationship management” (Accenture) and “networked presence” (UN). However, they assume that processes and work organisation are vertically, horizontally and externally integrated only by analysing web portals, and do not develop direct indicators of such integration. eGep’s is the most fruitful approach towards

analysing the transformations public administrations are undergoing with the incorporation of ICTs, building a framework for evaluation that emphasises the need for indicators on efficiency and generation of public value. However, it builds its indicators based on the comparison between offline and the online counterpart transactions, missing the possible transformations in the structure and the dynamics of public administrations.

Further and more in-depth research needs to be carried out if we are to build a solid assessment framework based on network-like organisation characteristics. A suggestions for future research could be the construction of indicators of interactivity and relationship strength - relating them to the use of ICTs - involved in the completion of specific processes - e.g. opening a new business or enrolling someone in school. Understanding how governments are transforming their operations, and to what extent, is essential to comprehend the effects on performance and the general improvement of public sector functions.

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Reaching Communication Quality in Public E-Forms – A Communicative Perspective on E-Form Design

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Abstract. This paper adopts a communication perspective on public electronic forms (e-forms). By doing so we define forms as instruments for communication and, thus, also instruments through which citizens perform different communicative actions towards government agencies. As such instruments, the forms might be more or less useful. The purpose of this paper is to explore what features of an e-form that increase the communication quality. We conduct a theoretical synthesis of three existing approaches for designing information systems. The result is a combined theory on key features of an e-form that make the establishment of communication quality more likely. The result consists of four key concepts, each of which give rise to one set of design principles for communication from the issuer of the e-form to the user (citizen), and one set of design principles for communication from the user (citizen) to the recipient of the e-form.

Keywords: Communication quality, usability, actability, electronic form, public e-service.

1 Introduction

Citizens interact with government agencies in many different matters. This interaction might be performed face-to-face or through a communication medium. In most cases forms are filled in as part of the interaction. Until fairly recently these forms were printed on paper, citizens ordered them from the agency, filled them in and sent them back by mail. Many early e-government projects, however, aimed at making the forms available on-line in Internet-based information systems (i.e. e-services) so that the citizen could print them. In more ambitious e-government development efforts the forms can be filled in electronically and sent to the agency via Internet. This is a key issue in many public e-services; to provide and manage electronic forms (e-forms) for communication between citizens and government agencies. The level of possible digital interaction through e-forms between the agency and the citizen is a frequent aspect when evaluating the level of 24/7 maturity [6].

A traditional way of viewing forms is that they are containers which transfer information from the citizen to the agency and vice versa. In this paper we suggest

a communication perspective as a complementary view. By adopting a communication perspective we identify that the forms are instruments for communication and, thus, also instruments through which citizens perform different communicative actions towards government agencies. A citizen might ask for a permission, request an allowance or a respite, declare income, appeal against a decision, etc. These are all examples of actions that the citizen performs when submitting a form to the agency.

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Correspondingly, the government agency performs actions both as issuer of the form and as recipient of the form. The issuer decides what communicative actions that will be possible to perform through the form, what information content that is possible to give, in what way this is supposed to be documented, etc. The issuer is often restricted by laws and regulations when designing the form. The case officer performs actions as recipient of the form on behalf of the agency, when he or she makes decisions based on the information content in the form. Common actions are for example to approve an application, deny a request, or ask for supplementary information (e.g. further details). A communication perspective on public e-services also emphasize the two-way communication character of e-services that has been discussed by several e-government researchers [c.f. 1, 11].

In this paper we define the e-form concept as an electronic equivalent of a paper form. The e-form serves as part of the user interface in a web-based public e-service, i.e. what the user sees and interacts with on the screen. In the same time it is more than just an interface since it is the media that the citizen uses to communicate with the agency. The content of the e-form is obviously often regulated by law; there can be demands for a signature to justify the citizen's identity, etc. The design of, and the content in, the e-form strongly influence what the citizen is able to communicate, i.e. the e-form stipulates what kind of communicative acts that are possible to perform.

The communication perspective, thus, highlights the fact that there are several communicating actors related to the e-form. Three roles are always present in e-form communication: An e-form is issued by one actor and usually filled in by another. The filled-in form is then received by a third actor (or, in some cases, the original actor). The actors filling these roles are in this paper called the issuer, the user and the recipient of the e-form (fig. 1). These roles may in reality be played by several individuals or a whole organization, but the roles are always present. The issuer generally issues several mostly identical copies of the e-form, each one filled in by a different user. An e-form may also have several recipients, especially if the e-form is

complex and the primary recipient is a large organization. The e-form might also be partly or entirely processed by a computer upon submission. Besides these roles, there is a fourth actor that influences e-form design and communication; the legislator. As stated above, laws and regulations are often restricting the issuer when designing the e-forms for citizen and agency communication.

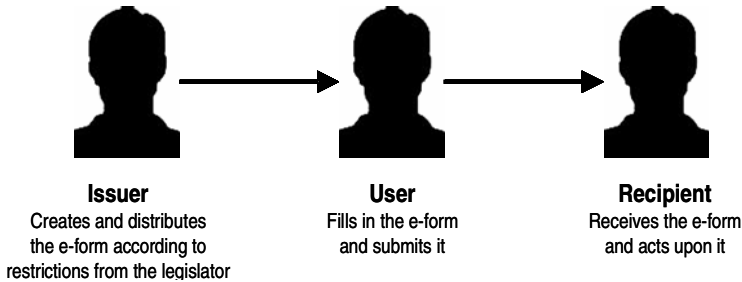


Fig. 1. The issuer – user – recipient model

By naming one of these roles “user” we do not imply that the user is the only one who makes use out of the e-form. In fact, since e-forms are parts of an organizational context there may be numerous of people who directly or indirectly benefit from the e-form’s existence and use. However, the user is normally the only one who directly interacts with the original e-form. In the context of public e-forms, the user is a citizen and the issuer as well as the recipient belong to a government agency. The concept “user” is therefore in this paper used as a synonym to “citizen”.

The communication perspective that we adopt in this paper has its theoretical roots in the language action theory [e.g. 2, 8, 5]. The key issue in language action theory is that people who communicate perform communicative actions (speech acts). Searle [8] defines speech acts as consisting of three parts; the propositional content, the illocutionary context and the illocutionary force. The propositional content describes what the speech act is about. The illocutionary context characterizes the significant background information of the speech act and the illocutionary force specifies the intended effect of the communication. (ibid.)

When viewing e-forms as instruments for communication it is obvious that the design of the e-form can result in an e-form that is more or less useful in order to perform a certain communicative action. We use the concept of communication quality to characterize what we mean by an e-form that is fulfilling its communication purposes as satisfactory as possible. Eriksson [4 p. 405] defines communication quality as “communication with qualities which contribute to actor relationships based on mutual understanding”. The purpose of the paper is to explore features of an e-form that increase the communication quality. By conducting a theoretical synthesis of three approaches for designing information systems, we arrive at a combined theory on key features of an e-form that make the establishment of communication quality more likely. The fact that we focus on the e-form and, thus, on the formal communication that takes place between the citizen

and the agency, does not imply that we are neglecting the fact that a certain amount of informal communication is performed through other media. In this paper, the communication quality concept is applied on the formal part of the communication, but it would also be relevant to assess communication quality in informal citizen and agency communication.

2 Research Method

This paper reports on a theoretical, conceptual work, even though the outcome of the study will apparently have practical influence. Three approaches for information systems design were analyzed with the aim to combine design features from the approaches and adjust these features to the context of e-forms. The three approaches were all characterized by design guidelines; i.e. a set of principles that covers critical standpoints of each approach. The first set of principles selected as data was a set of usability principles [7]. Keinonen's compilation of several previous usability models seemed to be a good starting point, since usability is the most frequently used and most well-known perspective on end-user issues. We argue that Keinonen's study represents this perspective well. While usability is critical it does not cover communicative issues deeply enough to allow a thorough appreciation of them. Therefore, two sets of principles derived from a communication perspective on information systems were included in the analysis. The actability principles, put forth by Cronholm and Goldkuhl [3], and the communication quality principles, put forth by Ericsson (2000), were chosen to represent this perspective.

These guidelines were analyzed by using a grounded theory approach [9]. The set of principles were used as data and the procedures of sampling, coding, comparing and conceptualizing were performed iteratively. By the third iteration the categories were beginning to feel saturated. Potential additional sets did not seem to enrich the developed concepts in any significant way. Thus, the analysis iteration was completed.

3 Information Systems Design Principles from Usability, Actability and Communication Quality

Usability is one of the most common perspectives used in analysing design features of information systems and has been focused in research since the 1980s. Much of the research is grounded in cognitive psychology, and centres on how the mental faculties of humans influence how we perceive and use different artefacts. Since there is no consensus on an exact meaning there are many different views on what usability is. Keinonen [7] condenses sets of principles from eight of the most commonly cited guidelines into a chart. This chart does not claim to be the definite word on what usability is, but gives a good summary of what the most generally agreed upon principles are. The principles in the chart are all recognised by several guidelines. In table 1, these eight generic principles for usability are presented.

Table 1. Eight generic principles for usability [7]

U1	<i>Consistency</i> – Do things the same way every time so that new things have to be learned only once
U2	<i>User control</i> – Put the user in direct control of the actions performed
U3	<i>Appropriate presentation</i> – Present all information in an appropriate fashion
U4	<i>Error handling and recovery</i> – Give advance warning and allow easy detection of and recovery from errors made
U5	<i>Memory-load reduction</i> – Help the user remember important information
U6	<i>Task match</i> – Provide exactly the information that the user needs, in the right order
U7	<i>Flexibility</i> – Allow adaptation to tasks and environments beyond those first specified
U8	<i>Guidance, help</i> – Give the user relevant guidance in understanding and using the system

Information System Actability Theory (ISAT) is a way of looking at information systems that highlights the actions that are performed through information system usage [12]. This view is based on a communication perspective on business processes. Information systems are seen as part of an organisational context in which actors perform communicative actions. Actability is defined as the ability of an information

Table 2. Ten generic principles for actability [3]

A1	<i>Clear action repertoire</i> – Help users to easily understand what they can do in the system
A2	<i>Satisfied communication needs</i> – Allow users to “say” what they want to say through the system
A3	<i>Easy to navigate</i> – Help users to easily move to another document
A4	<i>Action transparency</i> – Help users to understand consequences of proposed and performed actions
A5	<i>Clear feed back</i> – Help users to immediately see if the intended action is executed
A6	<i>Easy access to action memory</i> – Allow users to easily access information of what has been done previously
A7	<i>Personalized information</i> – Help users to know who has said what
A8	<i>Familiar and understandable vocabulary</i> – Help users to understand used concepts
A9	<i>Clear intentions</i> – Help users to understand the communicative intention of different messages
A10	<i>Support for actions</i> – Offer users a good support for business actions

system to “perform actions and to permit, promote and facilitate users to perform their actions both through the system and based on messages from the system, in a work practice context” [3 p. 3]. In table 2, ten generic principles for actability are presented.

Eriksson [4] presents a view of communication as the performance and interpretation of communicative acts. Part of this view is that communication is used to establish a relationship between communicating actors. Communication of high quality is defined as

“communication with qualities which contribute to actor relationships based on mutual understanding” [4 p. 405]. Eriksson also presents a set of generic principles for establishing communication quality in an information system. In table 3, these twelve generic principles for communication quality are presented.

Table 3. Twelve generic principles for communication quality [4]

C1	<i>Communication acts with a relevant and comprehensible information content</i> – Propositional components of communicated messages are relevant and understandable
C2	<i>Communication acts with a relevant and understandable action aspect</i> – Illocutional components of communicated messages are relevant and understandable
C3	<i>Comprehensible communication</i> – Communicating actors are able to understand each other
C4	<i>Trustworthy communication</i> – Communicating actors are able to trust the communicated messages
C5	<i>Communication acts which can be controlled and criticized by the interpreter and defended by the sender</i> – Messages are to be clear enough that the user can evaluate their validity
C6	<i>Trustworthiness/Security</i> – Communicating actors are trustworthy and have a good reputation
C7	<i>Empathy</i> – Communicating actors are considerate, respectful and cooperative towards each other
C8	<i>Reliability</i> – Communicating actors honour their commitments
C9	<i>Messages with a good presentation</i> – Presentation of messages is visually clear and aesthetical, supporting human cognition
C10	<i>Suitable media for the communication</i> – Medium is a viable way of conducting the communication
C11	<i>Good recollection of the communication and commitments made</i> – Actors are able to recall previous communication
C12	<i>Good access to information and communication</i> – Actors have access to the information they need

4 Features That Effect Communication Quality in E-Forms

In this section the categories developed by analyzing the coded data will be presented. For each category the underlying concepts found during the analysis will also be described. Data in this study was the design principles from the three approaches summarized in table 1-3. After analysing data, six categories were developed, see table 4 below.

Table 4. Developed categories and related design principles

Relationship quality	A7, C6, C7
Action space	U6, U7, A2, C2, C10, C12
Action comprehension	U1, A4, A8, A9, C1, C2, C3, C4, C5
Assistance in performing actions	U2, U4, U5, U8, A1, A5, A6, A10, C11
System interface	U3, A3, C9
Perlocutionary effect	C8

The principles in the first category deal with the way the relationship between the communicating actors is established and maintained. The concept of *relationship quality* was identified as an important aspect of communication in e-forms. The second category contains principles that cover the range of actions available to the user. This is known as the *action space*. The third category contains principles that deal with the users' understanding of what the actions performed within the e-form mean. This evolved into the concept of *action comprehension*. The fourth category contains principles covering how to make it possible for the user to select and perform the right actions. The core property of all these principles is that they deal with *assistance in performing actions*. The fifth category contains principles that are in fact not about communication but about interaction between the user and the system. Without a well-designed system interface it is often hard to do anything valuable with an information system. The design of the system interface (relevant to interaction quality) is, however, not within the scope of this paper and this concept will, thus, not be further analysed. The last category contains one single principle. This principle is not about the design of the e-form at all, but about the organisational process supported through the e-form. This is of course important but it is an external consequence and not in the scope of this paper (as it refers to process quality rather than communication quality). Thus, the first four concepts seem to be of importance to e-form communication. In the following sections we will therefore analyze these concepts to discover what they might imply for the communication quality of e-forms.

4.1 Communication from Issuer to User

The purpose of an e-form is to allow the user to perform certain communicative actions. The communication from the issuer to the user mainly functions as a guide for the user to the correct way of performing these actions. The most important part of the issuer's communication is the series of "cues" that encourage the user to perform certain communicative actions – to supply information, to confirm some state of affairs, to assert their identity, etc. Apart from these cues, an e-form regularly contains additional information aimed at helping the user perform the right communicative actions.

The first principle in this category deals with personalizing information (A7). There should never be any doubt as to who is behind a certain message. For e-forms this means that it should always be evident who the issuer is. Even though the issuer may actually be a group of people in a government agency, somebody should always be responsible for issuing the e-form. There should always be an actual person that the user can contact about the e-form. Another prerequisite for establishing good relationships is the trustworthiness of the issuer (C6). This will in part be a reflection of the general reputation and demeanour of the issuer. But it will also matter whether the e-form is successful in assuring the user that the communication from the issuer is appropriate and enough, and that using the e-form will be secure and meaningful. Lastly the issuer's empathy for the user's situation is a key (C7) to sending the appropriate message. The issuer should have a respectful and cooperative attitude towards the user. Showing that the individual social relationship with the user is valued is crucial for high quality in organisational processes [4 p. 54].

The action space is the space bounded by the possibilities and restrictions for actions that an information system has. The action space in this particular case is the range of communicative actions by the issuer that are or can be presented to the user. The first thing that the principles in this category tell us is to be relevant (U6, C1, C2, C10). This may be seen as an upper boundary for the communication from issuer to user. Communication that is not relevant should not be performed, presumably because this is confusing, disturbing and perhaps even irritating to the user. While it is important not to be irrelevant it also seems important to be comprehensive (A2, C12). This can be construed as the lower boundary for the communication from issuer to user. Providing too little information might render the e-form unusable. Keinonen [7 p. 27] expresses both these sentiments by stating that “According to the principle of task match, designers should provide exactly the information that the user needs, no more – no less.” Though this may seem obvious, it is of course very hard to anticipate exactly what the needs of the users are. What seems relevant to one user might be irrelevant to another. The last principle in this category seems to provide a way of handling this question. Applying the principle of flexibility (U7) would mean that the e-form should be flexible enough to handle the communication needs of different users. Preferably the user should be able to control how extensive the communication with the issuer should be.

The principles in the third category all deal with understanding the actions performed through the information system (i.e. e-forms in the e-service). This seems to be an essential prerequisite of communication quality within e-forms. Several principles refer to the vocabulary used in the e-form (U1, A8, C1, and C3). The language and other symbols used must be familiar to the user. Concepts and expressions should be used in a manner that is consistent, not only through-out the e-form, but consistent with the way it is used in other information systems, since most users will spend more time using other information systems than the particular e-form in question. Recognizing the language used is of course just the first step to understanding the underlying meaning and significance of the messages in the e-form (A4, C2). The e-form cues in particular, can be viewed as a request to perform a specific communicative action. The user must therefore be able to understand exactly which response that is being requested. Beyond understanding the actions of the issuer, the user should also be able to evaluate and criticize them (C5). The actions should be clear enough so that the user can evaluate the validity of the messages sent from the issuer to the user. The user should also be able to understand why the issuer performs a particular communicative action (A9, C4). Knowing the intentions behind the action makes it easier to select an appropriate response, and allows the user to determine whether the issuer has valid reasons for requesting a certain response.

Supporting the performance of actions for the issuer-user communication is mainly about making it as easy as possible for the user to receive and understand the appropriate communication from the issuer. The system (i.e. the e-service) is designed to support a certain action space. This is not the most important action space though, as it is the perceived action space of the user that determines what action the user might try to take. At any point it should be obvious to the user what messages are available from the issuer (A1), but the user should always be in charge of what messages the user will receive (U2). Several principles also deal with memory-load reduction (C11, A6, and U5). The less information that the user is forced to

remember, the more the user can focus on the task at hand and on analysing further actions. The system should therefore offer a good recollection of previous communication and commitments made.

4.2 Communication from User to Recipient

For the user, using an e-form means performing certain communicative actions. The actions are performed through a series of cue-response pairs. Each cue is accompanied by a means of responding – an option to check, a field to write in, a value to select, etc. To respond to these cues is to fill in the e-form. After the user has performed all communicative actions the e-form is said to be submitted. E-forms are often, but not always, constructed in such a way that no individual responses are submitted to the recipient until all required responses are filled in and the user has expressively submitted the whole e-form. Different kinds of quality controls of the information are possible to conduct before submission. Apart from responding to the cues, a user might want to provide certain information not asked for or ask the recipient a question.

Key to high quality relationships is to personalize the communication (A7). Since the recipient of a public e-form may often be someone in a large government agency it may be impossible for the user to know exactly who will interpret his or her communicative actions (and this might actually not be decided until after the form has been submitted). It is still important that the user is able to picture who the recipient will be, since the user's view of the recipient will influence the communication. If the user can identify with the recipient's situation there is a better chance that the appropriate action will be taken (C7). There should always be a clear way of contacting either the recipient or the issuer. The user must also be assured of the competence of the recipient to handle the submitted e-form in a proper way, i.e. comprehend the user's communication and act on the commitments made through receiving the e-form. The user should also be able to trust that his or her integrity is respected and that the submitted information is not misused in any way (C6). As computers are getting more advanced and more ubiquitous, more and more functions in our society are getting automated. It is possible to create e-forms that are both filled in and interpreted automatically, by computers. Interacting with a computer and with another human being is very different however, and for this reason it is always important to indicate whether the user's actions will be interpreted by a human being or by a computer (A7). Designers of e-forms must be aware that having an automated recipient may in many cases negatively influence the communication quality. For one, the user might find it harder to trust in the competence of a computer to interpret the user's actions in the right way, which may limit the messages the user feels comfortable sending (C6). The interaction with the computer may also not be accompanied by the same feeling of mutual commitments as human communication which might lessen the user's empathy for the situation (C7).

The action space in user-recipient communication is the range of communicative actions that the user can perform. Just as for issuer-user communication it would seem important to find a balance between action relevance (U6, C2 and C10) and comprehensiveness (A2, C12). For many e-forms identifying the actions that are relevant for the user would be hard, if not impossible. E-forms are designed with the purpose of facilitating one or more

types of actions. E-forms vary greatly, however, in how unrestricted communication can be. Sometimes the possible actions are very strictly defined (e.g. answering a yes/no question), other times they are more free (e.g. an open field where the user can send a question or message to the recipient). The task of finding a balance between relevance and comprehensiveness highlights the importance of defining one's view of the user. This paper views users as being cooperative communicators. When designing e-forms one should, thus, trust the user in determining what to communicate. As long as there is sufficient assistance in performing actions there is no reason to mistrust the communicative intentions of the user. There might often be a good reason when citizens want to give some extra information or ask a clarifying question. Therefore the user should generally be as free as possible in choosing what to communicate through the interface (U7). Of course this principle must be used in a conscious way when designing public e-forms, since authority decisions are to be made from the information in the e-forms. Citizens' justice must not be violated and laws and regulations must be followed.

In order to be able to select appropriate responses the user needs to understand the possible actions that are available. First of all, the user must understand the language used in the e-form. The available actions should be described in a familiar and consistent way (U1, A8, C1, and C3). von Wright [10] describes three parts of an action: doing (performance), result and consequences. The user must fully understand each of these three parts to comprehend the actions available (A4). Doing is the act of performing an action. The user should be able to fully understand how the action is performed before doing it. The result of an action is the thing that gets done by performing the action. Before undertaking an action the user should be able to understand what the result will be. The consequences of an action are all the things brought about by the action. These can happen as an effect of the action, but are not controlled by the actor. For an e-form, these are for example what happens after the e-form has been submitted. The user should be able to understand what the consequences of an action are supposed to be before carrying it out. There should also be a clear timeline for when different consequences take place, for example when an application will be approved if the user submits the e-form today.

Understanding the actions available is not enough to be in control of the situation. The user might also need support in choosing and performing the appropriate action. The principles in this category all deal with giving the user control of the situation. It should always be obvious to the user what the possible actions are at any single point (A1). In addition to having a clear perception of the current action space the user should always have a clear overview of the entire use situation for the e-form (U8, A10). After the user has selected the action, the information system (i.e. the e-service) should offer the appropriate support for performing it. The ideal situation is when the user is in direct control of the actions performed (U2). This requires clear feedback (A5) on all actions. The information system should warn before doing any potentially hazardous actions, especially ones that cannot be cancelled. After performing an action the user should be able to undo erroneous actions or edit the communicated message without having to redo the whole thing again (U4). This means that how to withdraw a submitted e-form should be clear.

5 Conclusions

By conducting a grounded theory analysis, the design principles of three existing approaches have been categorized and some key concepts have been identified. These have thereafter been analyzed for two types of communication: communication from the issuer to the citizen and communication from the citizen to the recipient. By doing this we have arrived at a combined theory of how communication quality in e-forms can be established, consisting of four key concepts. The combined theory is formulated in an idealistic way, which implies that the design principles are presented without consideration of external conditions that of course also might influence the e-form design. The ideal types are inherited from the three analyzed approaches.

Relationship quality – The identity of the issuer should be plainly visible in the e-form and there should be an easy way of contacting either the issuer or the recipient. The issued message should be empathic to the citizen's situation and instill trust in the governmental process at hand. It should be clear who the recipient of the e-form is. The citizen should be able to trust that the recipient will understand the submitted message and honour commitments made. The citizen should be assured that submitted information is handled with integrity. *Action space* – The communication from issuer to citizen should be comprehensive but relevant. The e-form should be flexible enough to handle citizens with varying needs. The citizen should be able to communicate everything that he or she determines to be relevant. The e-form should preferably not disallow messages not following the desired syntax. *Action comprehension* – The issuer should use a familiar and consistent language. The citizen should be able to understand which response that is requested and the reason why. The messages should be clear enough so that the citizen can evaluate their validity. Before undertaking an action the citizen should be able to understand the performance, result and consequences of it. *Assistance in performing actions* – The citizen should be able to recognize what messages there are from the issuer, and choose among them. The e-form (and the e-service) should strive to reduce the memory-load of the citizen and offer a good recollection of previous actions. To be able to select the appropriate actions, the citizen should have a clear overview of the entire governmental process, and what actions are possible at every single point. When needed, the citizen should get guidance on how to perform the selected action. The citizen should be able to control the selected actions directly, with immediate feedback and the ability to undo or edit previous actions.

These four key concepts and their underlying design features are derived from a conceptual, theoretical analysis. This approach has resulted in design principles for communication quality in e-forms that are well grounded in theory. The next research phase is, thus, to apply these features in practical e-form design and evaluation settings. When testing the theory empirically, the issuer-user-recipient model will be applied.

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Assessing the Role of GIS in E-Government: A Tale of E-Participation in Two Cities

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Abstract. This paper will deal with the question of what the influence is that Geographical Information Systems have on policy design in, e-government and e-democracy. A conceptual model of policy design is used with which two case studies will be analyzed in which GIS was used to encourage participation of citizens in urban planning and redevelopment. It will become clear that the potential of e-government cannot be reached while governments, citizens and the institutional setting have not adapted to the reality of e-government as of yet. Demonstrated will be that certain groups stay excluded in the policy process and that e-government is limited by the risk averting behavior of governments. However it will also be shown that e-government can help bridge the gap between government and citizen and can lower the scope of conflict between the two.

Keywords: Geographical Information Systems, E-Government, Public Participation.

1 Introduction

In the Dutch municipalities of Helmond and Tilburg plans were made to do some redevelopment of the urban centre. An e-government application was used to promote participation in the plans. A program was created, named 'Virtuocity' in which citizens could access the cities virtually, be informed and participate in the policy design process. The program 'Virtuocity' is a Geographical Information System (GIS) and has features like the quality of visualization.

E-government can be described as the use of ICT by a public organization to support and redefine information, communication and transaction relations with citizens, companies and the environment to create increased government access, better service delivery, internal efficiency, supporting public and political accountability, increased public participation. [2] Since e-government is becoming the norm it becomes relevant to research the influence the applications facilitating e-government could have, therefore also influence of GIS, on policy design, e-government and e-democracy. This is then the main question in this research: *What is the influence of Geographical Information Systems on policy design and how do they shape the content, course and the outcome of this process?* Policy design is defined

here as the process of defining, considering and accepting or rejecting options for political decision. [8] This paper will use the municipalities of Helmond and Tilburg as case studies. The cases will be analyzed by using a conceptual model of policy design, made up out of existing insights of policy design.

The structure of the paper will be as follows, first an explanation will be given of what GIS entail and what their qualities and effects are. Next a conceptual model of policy design will be provided, on the basis of this model the cases will be analyzed. Third both cases, Helmond and Tilburg will be described and later the conceptual model of policy design will be applied. Finally in the conclusion an attempt to answer the research question will be made.

2 Geographical Information Systems

GIS are a form of ICT, they can order, manage and integrate large quantities of spatial data, they can also analyze this data and present it mostly in the form of a map. [15] But GIS has some features other ICT's do not. There are several qualities attributed to GIS that may have an effect on policy design. First it is said that GIS serve a function of calculation, in this way different policy alternatives can be closely evaluated and costs and benefits can be predicted more accurately and predictions can be made. A second quality of GIS is the function of control and discipline. This means that work procedures can be standardized and in this way the linking of different data sets becomes possible, information that was unavailable before can be generated. Thirdly GIS is said to increase transparency. GIS can structure work processes and data can be collected on the course of these processes, the process in itself becomes more transparent and this opens the possibility to adapt these processes. Next GIS can help approach different angles of a policy problem and in this way increase the accessibility and transparency of the problem. Since GIS can calculate large quantities of data and is able to visualize issues in a comprehensive matter a problem can become clearer. Fourth GIS can make, on the web, policy proposals visible for people all over the world, this could benefit e-government to a large degree. E-government can also benefit by an increase in transparency while GIS can visualize complex data in a very simple way, so that one could right away understand a policy proposal.

3 A Conceptual Model of Policy Design

The underlying structure of the conceptual model is social constructivist in nature. This because in this research GIS are regarded as socially constructed, using the approach of Social Construction of Technology. In this approach it is believed that society shapes technology. GIS are a construct of society, the way GIS are designed and used determines the way they are seen in society, which in its turn accounts for the outcome. Therefore outcomes are not fixed or inevitable and technology is not seen as autonomous. [4] Where GIS can be seen by some as a means for participation it can be seen by others as a tool to exclude certain groups.

Secondly the existing models of policy design used to make up the conceptual model are social constructivist in nature. All the models used assume that society and policy is constructed by the beliefs, values, actions and interactions humans conduct

in. Policy is not seen as autonomous or inevitable but as a social construct. Methodologically therefore, it is consistent to construct the conceptual model in a social constructivist manner as well. Finally GIS are fairly new and this approach can explain how the shaping of GIS came about. [3, 20]

The conceptual model of policy design is, made up out of insights of existing models of policy design: the satisficing model, in which actors opt for a design that is satisfactory instead of optimal [19], incrementalism which holds that actors do not divert far from existing policy, [12], the normative optimum model, in which extra-rational components are added, like creativity or risk aversion, next to rational components [6], the mixed scanning model, which holds that policy is designed through different levels, first the scanning of alternatives very general, second looking at alternatives in detail [7] and the institutional analysis and development framework which assumes policy design is product of interaction which in its turn is influenced by leading culture, rules of conduct and institutional features. [16]. The basic features of these models used for the conceptual model are listed below.

Table 1. Basic Features of the models used for the conceptual model

	Core Concepts	Analysis	Final Design based on
Satisficing Model	-bounded rationality -satisficing	Means - end analysis is used, actors act goal oriented, but analysis is limited by the bounds of rationality.	Matching the criteria to being satisfactory.
Incrementalism	-limited rationality -conflict of values -incremental decisions	Means and ends are not distinct and analysis is very limited, possible outcomes are neglected.	Degree of deviation from past policy.
Normative Optimum Model	-extrarational components -limited rationality -conflicting values -available means	Means are looked at before ends.	Availability of the means
Mixed Scanning	-limited rationality -conflict of values -power -available of means	Means en ends are not distinct. Analysis is divided into levels, in the first analysis is limited, in the second analysis is comprehensive.	Proving to be the best alternatives among the relevant alternatives and being backed with enough power.
Institutional Analysis and Development Framework	-institutions -culture -rules in use	Means – end analysis depends on the theory used within the framework.	Interaction between actors in the action arena, influenced by culture, rules of the game and the community.

From these five models those concepts were taken into the conceptual model that prove to be valuable in explaining the relation between GIS and policy design. These will form the building blocks of the conceptual model. Along these lines the case studies will be analyzed.

of power is far more likely to see a large deal of his values and beliefs back into the proposal.

There are two additional things that must be mentioned before a final policy is designed and agreement of one or more groups on the design is found. First the idea of bounded rationality which holds that actors cannot account for all possible consequences, cost and alternatives, they are limited in the degree in which they can act rationally, it is therefore in this conceptual model not the case that actors base their decision on rational calculation.

That brings us to the final concept, namely satisficing. Agreement on what is optimal is hard to be found, time and resources are mostly lacking. Therefore in the conceptual model of policy design the groups will not aim for an optimal solution, but for a satisfying solution.

Technology and thus GIS are placed outside of framework consisting of the action arena and the rules in use, culture and formal institutions. While technology is socially constructed, [4] it will influence the action arena, the different groups and their relative power as well as the way they deal with information and different alternatives. The culture, rules in use and formal institutions that helped shape this technology are now to be influenced by it.

Summarizing this means that there is an action arena, in which interaction is influenced by formal institutions, rules in use and culture, and in which several groups try to push their values, which could conflict with values held by other groups, forward in order to come towards a policy design matching their values. All actors are limited in the degree of rationality they can demonstrate. They will aim for a satisficing solution; first because time and resources are scarce, second because they know consensus has to be made. Finally agreement will be reached and one alternative will be chosen as the alternative that will constitute for the policy design.

3.1 Expectations

On the basis of this conceptual model some expectations can be made regarding the case studies. First it is expected that GIS influences the rules in use while new groups of actors could become involved, therefore these rules must be adjusted. GIS could also make things possible that were impossible before which asks for an adaptation of the rules. Secondly it can be expected that GIS will attribute to the confliction of values, again while new groups of actors might come into play. The existing balance of power therefore might change. Thirdly bounds of rationality might be lessened. It is to be expected that GIS could have a profound impact on policy design by its calculation functions. Therefore the bounds of rationality could be limited. Fourthly it can be expected that because of the ruling culture the usage of GIS will not reach its full potential.

3.2 Research Strategy

The conceptual model as described above will be used to analyze the cases of Tilburg and Helmond. In both cases the method of research chosen was qualitative in nature, documents were viewed and interviews with policy makers, public administrators, architects, computer experts and the public were conducted. The choice for these two

cases is in the first place because of their similarity; they both deal with the same GIS application used for visualization and participation in the field of urban redevelopment. Secondly these cases are unique in their kind in the Netherlands. Helmond was the first municipality dealing with urban redevelopment through GIS using citizen participation and visualization, for Tilburg the same is the case with the addition that there was actually the chance to vote, this being completely unique in urban redevelopment in the Netherlands.

4 The Tale of Two Cities: Helmond and Tilburg

In the municipality of Helmond in the Netherlands plans for some urban redevelopment were made. In 2004 it was decided not to do so in a conventional fashion but to invest in e-government.

In 2006 the municipality launched a website in which the new urban centre was to be visualized through a three-dimensional technique, developed together with CEBRA. On this website citizens were able to log on from their computer at home. This all without any form of identification, the program had to be downloaded on one's computer though. In this program, named *Virtuocity*, with a username and an avatar one could virtually walk through the new urban centre of Helmond, just like in a gaming situation. Additionally there was also a possibility for citizens to react to the plans for the redevelopment on a forum. Furthermore there were fixed times on which citizens could chat with the aldermen to give their opinion or to ask questions.

At first the city council hesitated to implement *Virtuocity*, there was fear that citizens would protest against every new building on the site, especially since all became so clear in a detailed virtual environment. The city made it a top priority to make sure the website was accessible for as many people as possible. CEBRA made sure this came about and also installed a helpdesk. Before launching the website CEBRA together with the city of Helmond asked a test panel to test the website so they could still change some of its features. The test panel decided that the technology worked perfect although it seemed a little dull. Therefore CEBRA included sound into the site.

Plans to actually have people vote for policy proposals failed even before they reached the city council. The municipality of Helmond did not wish to do so out of fear that citizens would decide on something the city would like to see otherwise.

People felt so much informed and taken seriously that there were almost no complaints on the redevelopment plans. It now is the belief that when citizens are informed and are able to see what is going to happen to their city they are less likely to complain. The chat and the forum proved to grow out to not only a place where citizens could share their opinion but to a social gathering place in which each day thirty to forty people meet up. This became to function as a bridge between the citizen and the government. Opinions of citizens were actually taken into account when a playground was designed, through means of a poll. Based on the outcome of the poll the city council decided upon the plan for the playground.

Although while launching the project there were not significant discussions or arguments against it in the city council, genuine e-democracy was not possible. It is claimed that public administration is not ready for these kinds of risks.

It is the city's opinion that Virtuocity made communication with citizens much easier, since plans are more appropriately visualized they can be made clear more easily without any ambiguity, policy becomes more transparent which, in the city's viewpoint, makes communication easier. Citizens feel more involved, can actually participate and feel taken seriously.

The municipality of Tilburg used the same program, Virtuocity in 2006, this for the redevelopment of a square named 'the Heuvel'. As for Helmond this version of Virtuocity, also developed together with CEBRA, had the features of a gaming situation in which one could walk around the square, the chat and the forum were there even though initially this was not the plan. But the city of Tilburg took Virtuocity a little further. It made it a tool with which people could vote for what the square should look like.

On the basis of a competition in which citizens could show what they believed the square should look like eight different architects were invited to make a design of this square. A jury of experts picked out three designs; these together with the current situation were placed in Virtuocity. Citizens could thus walk through four designs and in the end vote for the design they appreciated most. The aldermen committed themselves to take over the advice of the citizens and thus chose the design with the popular vote. The municipality of Tilburg, in the process of launching Virtuocity, was very afraid that opposition in the council would complain about the vote not being representative, while only voting through the internet was possible. Another point was how to prevent fraud, since nobody had to register. The fraud problem was partly solved by filtering out IP-addresses which held more than one vote. For the problem of representation there was no solution found, initially a plan was made to impose a minimum vote for the vote to be valid but this plan was never executed. In order to enable as many citizens as possible to vote computers were placed in several public places where help was available.

In the end of the voting period, there were 115.000 visits to the site and over 4000 votes cast. The reactions in Tilburg were slightly less positive than in Helmond. In the first place citizens were upset that not all computers could run this program, secondly citizens were not pleased with the fact that they had to download something on their computer in order to use Virtuocity. Citizens were also skeptical towards the municipality of Tilburg while some did not believe that their vote would actually be listened to.

Again there were no significant problems to get this plan through the city council. The city claims that society is not ready for this type of voting yet, conventional means should also be used.

Architects were pleased with the idea of a virtual space for their design but were sceptic as well. They claim that Virtuocity makes the idea of a design more clear but the way their design was projected was not the way they wanted it to look. Additionally an architect in this way cannot show the underlying vision of a design.

For both cities it can be said that municipalities as well as citizens hold the opinion that Virtuocity accounts for an experience, a virtual journey. Furthermore Virtuocity, while it was initially intended to serve as a tool of visualization, became a means for communication, between citizens but also between citizens and government, a means for transparency and a means for participation. The decision to use Virtuocity in both cities was not based on a rational cost benefit analysis, but on feelings of creativity

and need for innovation. Due to the idea that consequences could not be calculated both cities did not choose for an optimal alternative.

5 Assessing the Role of Geographical Information Systems

When assessing the role of the program *Virtuocity* in the cases of Helmond and Tilburg using the conceptual model of policy design we must start with the action arena. Several actors can be distinguished between, the citizens, the governments of the cities, the designer of *Virtuocity* CEBRA and in the case of Tilburg also the architects. These are the groups interacting in the action arena.

For the formal institutions we can clearly see that of course the government is bound to the law, in Tilburg the voting did not have the character of a formal referendum since this would legally be very difficult. If the vote had the character of a formal referendum groups would be excluded, which would make the process not democratically legitimate, also the means to detect fraud were not available. Additionally it is seen in Helmond that attempts made to achieve a voting situation failed because of opposition. This demonstrates that in these cases the institutional setting, government in terms of know-how as well as citizens are not ready for e-participation. The potential of e-participation cannot be reached as long as the parties involved are not able to use their means to this potential. [9]

Regarding the rules in use it is seen in both Tilburg and Helmond that the rules in use require citizens to participate in the redevelopment of their city. Another point that falls under the rules in use in this situation was interactive policy design. This is done because it is said to close the gap between government and citizen, it creates acceptance for certain policy proposals and finally it enlarges the quality of policy because the proposal can be looked at from different angles. With this interactive policy design there are some features that are most important, firstly openness, which means that all groups must be able to participate, secondly equality of different groups of actors, thirdly dialogue must proceed in a reasonable fashion, fourthly everybody should have the opportunity to exert influence in the matter and finally communication must proceed through different channels. [1] It becomes clear here that GIS can demonstrate a large potential for interactive policy design. Through a web application citizens are able to participate. GIS and *Virtuocity* show that communication can proceed through different channels, not only a virtual meeting place but also a presentation of plans independent of place and time. The visualization function of GIS makes it easier to explain and demonstrate what plans entail. Following the line as for the institutional features, when the rules in use do not adapt to the current situation of e-government in terms of computer possession and computer use, e-government will not reach its full potential and therefore will be limited. [9]

Thirdly the culture comes in, leading values and norms show us two things, first that citizens do want to participate in the redevelopment of their city. With *Virtuocity* we see that citizens feel taken seriously, *Virtuocity* was able to demonstrate what the exact plan was going to be, for this reason, there were less complaints about the plan than usual. Secondly we see a culture of risk aversion in government. Since GIS are fairly new, consequences of policy are not very easy to predict and influence by

citizens can go out of control, the two cities therefore did not execute the complete plan because they feared the risks. In general this demonstrates that e-government, at least for these two cases, has two faces. Citizens are pleased to participate in the possibilities of e-government and this seems to lessen conflict, bridge the gap so to say, between citizens and government. [10] On the other hand, governments seem to be reluctant in using e-government applications while consequences are hard to predict, risk aversion is the reason why governments are reluctant to push e-government applications to their full potential as seen in other cases. [5]

When looking at conflicting values and the relative power of the different groups we see in both cases that the most power stays with the government. This emphasizes what the reinforcement thesis claims, that those in power are only strengthened by the technology use. [11] CEBRA also holds a large deal of power, influencing the government to extend the web application. Citizens in both cases gained power compared to conventional ways of urban redevelopment. Conflicting values are clearly seen between CEBRA and the architects, where CEBRA must balance between a high resolution and an easy accessible program, the architect wants the resolution to be as high as possible, CEBRA and the governments experience the same clash, where CEBRA balances, the governments want the accessibility to be the highest priority. Citizens also complain about accessibility and exclusion but large conflicts of value between citizens and government seem not to have occurred, this most likely because most citizens felt empowered and taken seriously. Additionally citizens with no computer or no computer skills were excluded from the process.

Bounded rationality comes very much forward on the side of the government in the way that consequences cannot be calculated, the program is too new to predict consequences and therefore a rational calculation cannot be made. Together with this bounded rationality we see risk aversion and a reliance on creativity and need for innovation instead of a rational actor approach. On the side of the citizens the opposite is the case, Virtuocity made plans comprehensible for citizens, therefore the limits to rationality they had before in terms of their ability to understand consequences and courses of a plan, decreased.

Finally the concept of satisficing, as stated above due to the idea that consequences could not be predicted the risks seemed very high, in a culture of risk aversion governments would rather go for a satisfactory alternative than for an optimal alternative. As said, risk aversion on the side of governments limits all possibilities of e-government applications to be explored.

6 Conclusion

Coming back to the expectations made we can see that regarding the first expectation the rules in use have changed, there emerges a new group of actors in the field, the designers of the program, the public plays a larger role as well. The rules of interaction therefore had to be adapted shifting away autonomy from the governments towards the designers. While the governments have little knowledge on the working of programs like Virtuocity the designer gets to decide a large deal of the course of the process.

Regarding the second expectation it can be stated that conflict in values has only lessened. This is mainly due to the way GIS is able to visualize the project, in this way the plans are more transparent to citizens. Citizens feel more secure about the plans and the possibility to participate diminishes conflict as well. Within politics the same goes, little critique was given to the plans because GIS made the plans so transparent they were clear to all parties. Insecurity diminished and therefore also conflict. For power another thing must be said. The governments had the fear, especially in Helmond, that they would lose power to citizens and therefore in Helmond the full potential of Virtuocity was not reached.

The answer to the third expectation is two fold. First the bounds of rationality were lessened because of the visualization function of GIS. Where a maquette or sketch of the future urban design was not comprehensible for a large group of people, Virtuocity made it possible to experience the future situation. The situation became more transparent and people were able to understand the end result. On the other hand the bound of rationality were not limited at all. The main reason for not using Virtuocity to its full possibilities was because of the unpredictability of the consequences. It seems therefore, of course because the application was new, that the unpredictiveness of matters only increased.

Finally it can be said that indeed the potential of GIS is not reached because of the leading culture. Not everybody owns a computer or knows how to work it. A formal referendum was also not possible. In order to have citizens vote on questions of urban redevelopment additional to Virtuocity a conventional ballot would be needed. Citizens seem also unwilling and cautious to register for programs and to download a program on their computer. Governments are also not ready to deal with the possibilities of GIS; proper means to prevent fraud are not yet common in government.

Coming back to the research question of this paper: *What is the influence of Geographical Information Systems on policy design and how does it shape the content, course and the outcome of this processes?* We can see that GIS enlarged transparency of policy, by demonstrating to citizens how the plans were being executed, they improved participation by creating a social gathering place, they improved communication between citizens but also between citizens and government and attempted to increase democracy when people were allowed to vote.

On the one hand this corresponds with what advocates of interactive policy design claim, that democracy will be enlarged and the gap between citizens and governments can be closed. On the other hand, critics claim that the citizens will be excluded since requirements to join are too high, therefore interactive policy design will not lead to more democracy and will only have the opposite effect. [14]

In both cases it can be concluded that while citizens felt they were being heard in practice little extra democracy was added. Therefore the evidence in the cases does support the thesis that the gap could be lessened but not the thesis that democracy would increase. The question whether GIS and interactive policy design will enlarge democracy cannot be answered here, even though advocates believe the potential is there, evidence from cases suggest otherwise.

The process of interactive policy design became easier in both cases because of the influence of GIS, participation was possible through different channels, plans were clearer and communication became easier. It was also demonstrated here that citizens

do want this kind of influence that is easily to access and not dependent on time and place, contrary to what critics of interactive policy design believe [14].

But the other side shows that while the application is new governments might not want to use it to its full potential, this because consequences are unpredictable and they want to avoid risks. In terms of power it becomes clear that while government still holds the largest part of the power the relative power of the designer of the application increases, to the point where it can influence government. Relating this to the reinforcement hypothesis [10] in both cases the status quo is reinforced. The elite in power decides what can be decided on by citizens and the way in which they are allowed to do so. In this way the situation in the cases described supports the reinforcement hypothesis to a certain degree, but not completely. The hypothesis that through the use of computers power will flow from governments to technocrats [21] is supported by the cases of Tilburg and Helmond. CEBRA had a lot of influence in which technology to use and how to use it. Therefore it can be concluded that while the reinforcement hypothesis stands its ground in the relation between government and citizens this cannot be said in the relation between the government and the designers of the technology, government loses power here. Concluding it can be stated that while the reinforcement hypothesis cannot be completely disregarded, in the cases described it does not live up to its full promise.

Taken broader we see that the full potential of e-government cannot be reached as long as the parties involved are not able to use their means to this potential. When citizens do not own a computer or do not possess computer skills, when governments do not have the knowledge to solve problems coming forward in e-government questions and are reluctant to take risks, and when the institutional setting does not make steps towards incorporating matters of e-government into the setting, the potential of e-government as well as e-democracy will not reach its potential.

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A Trust-Centered Approach for Building E-Voting Systems*

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Abstract. eVoting is a challenging approach for increasing eParticipation. However, lack of citizens' trust seems to be a main obstacle that hinders its successful realization. In this paper we propose a trust-centered engineering approach for building eVoting systems that people can trust, based on transparent design and implementation phases. The approach is based on three components: the decomposition of eVoting systems into "layers of trust" for reducing the complexity of managing trust issues in smaller manageable layers, the application of a risk analysis methodology able to identify and document security critical aspects of the eVoting system, and a cryptographically secure eVoting protocol. Our approach is pragmatic rather than theoretical in the sense that it sidesteps the controversy that besets the nature of trust in information systems and starts with a working definition of trust as people's positive attitude towards a system that performs its operations transparently.

Keywords: Tools and Technologies for eParticipation and eVoting, Trust and Security: provisions and instruments, eDemocracy and eParticipation Challenges, Risk Assessment, Cryptographic Protocol, Security Architecture.

1 Introduction

The rapid growth of Information and Communication Technologies (ICTs) and the diffusion of Internet in people's everyday lives in conjunction with the need for more, better and economical government services to the citizens has led the past few years to the development of eGovernment throughout most of Europe. In this context, democratic societies face the challenge to improve public participation in political debate and policy formation processes, realizing the concept of *eParticipation*. One of the most important and critical facets of eParticipation is *Electronic Voting* or eVoting. eVoting has attracted lately the attention of many governments as an alternative to conventional voting with the hope to increase citizens' participation and reduce the costs.

While eParticipation initiatives have been deployed across the EU with mixed results so far, some encouraging signs come from few but important eVoting initiatives. In Switzerland, for example, eVoting and especially Internet voting, was recently introduced as a complementary channel for elections and referenda, with great success. One of the reasons might be that remote voting was largely practiced through postal voting for many years. The introduction of Internet voting came as an alternative and easier way to vote remotely and thus was rapidly accepted. In 2005, Estonia carried out the first Nation Wide online elections in the EU. It was the result of a bold political decision rather than a natural evolution as it came to be in Switzerland, but it placed Estonia on the forefront of the eVoting efforts in Europe. This, perhaps, would not have been possible if the government had not already implemented an advanced IT Strategy and a Nation Wide Digital ID scheme. In both cases, some basic conditions were met to allow the fruitful deployment of such initiatives, in terms of the necessary infrastructures, institutional measures and government policies employed to support large scale deployment of eVoting projects.

Recent efforts to implement eVoting in Greece, face in that respect many challenges, such as the lack of a specific institutional framework supporting the deployment of eVote applications at large scale (e.g. PKIs) or the low ICT and Internet penetration rates (around 25% [17]) and the resulting digital divide and “digital culture gap”. In addition, the general lack of trust in ICTs and the Internet, as a safe medium to conduct secure transactions, further hinders these efforts.

This lack of trust in ICTs and the Internet affects very seriously any effort to migrate from the conventional and long established voting procedures to an electronic voting system, since voting is a fundamental process in any democracy. Moreover, the abundance of cases of misconduct in electronic voting has resulted in severe decrease of *trust* among citizens [2]. However, eVoting, despite the critique, seems to be, still, a hot discussion issue and, possibly, a worldwide reality in the future.

According to the above, any successful eVoting system should target at increasing *citizen's trust*. Trust, however, is difficult to establish in the eVoting domain since eVoting is necessarily based on complex distributed information systems, involving complicated interactions between computers, between humans, and between humans and computers.

There is much ongoing research in the development and analysis of new trust management models for complex and dependable computer systems. Blaze *et al.* in [3] proposed the application of automated trust mechanisms in distributed systems. In [9] the focus is on the strong relationship between the notions of trust and security. Moreover, a number of schemes for the design of secure information systems have been proposed (see, for example, [5], [8]) which are based on automated trust management protocols. The composition and propagation of trust information between elements of information systems is also of pivotal concern and a number of research works are devoted to them (see [18], [11], [24],[7]).

With regard to trust in the eGovernment domain, specifically, there are specialized research efforts in building trust models based on distributed trust agents, much like as in PKIs [23]. There are many open issues both conceptual and practical, however, that pertain to eGovernment trust, many of which are discussed in [19] and [21].

There are even less efforts for trust management in the eVoting domain. Due to the complexity of an eVoting system, most efforts are focused on the study of specific

system security requirements such as, for instance, establishing uncoercibility of the voters ([1]). Also, as a common practice for strengthening trust, many approaches focus on the existence of a voter verifiable paper copy of the ballot or the design of strong cryptographic protocols (e.g. [20],[6]). Finally, the work done by the OASIS consortium [16] is a first step towards the standardization of secure eVoting architectures based on formal modelling and risk assessment methodologies (e.g. use of the EML language and threat evaluation techniques).

In this paper, we propose a system-oriented trust management approach that handles eVoting at a system engineering level, as a whole. The approach targets all the phases of system design, implementation and testing, using trust modelling and risk assessment methodologies in conjunction with strong cryptographic protocols. This approach is currently being applied for the implementation of an Internet-based eVoting system that will be initially deployed in an actual voting process by the Technical Chamber of Greece.

2 Trust in the eVoting Domain

Since trust, as people's attitude, plays a major role in the way people view and use information systems, lack of trust renders even expensive and sophisticated information systems completely useless. In most of the information systems that deliver e-services, trust is based not on some publicly available systematic design process, but rather on the reputation of the system's implementer (e.g. a well-known company) and operator (e.g. the government).

On the other hand, trust is a hard to formalize concept that also raises philosophical and social (i.e. non-engineering) concerns. For instance, Luhmann's research [15] considers trust as a mechanism which causes the reduction of complexity. Coleman [4] distinguishes certain elements that define a trust situation between a trustor and a trustee. By definition a voting procedure is a trust situation, and in this case trust properties have to be reflected both on individual and system level, independently of the voluntary, custom/norm based, institutional or obtruded nature of the procedure. Trust is an emergent social property based on interactions between actors and for this reason, an eVoting procedure could, in principle, be established, if and only if, actors are convinced that it complies with certain trust properties.

Given the multifaceted nature of trust, in our approach the concept of trust is *pragmatic* in the sense that we rely on a *plausible* working definition and proceed in order to satisfy the definition's prerequisites for trust. One possible definition of trust is the following:

Trust of a party A in a party B for a service X is the measurable belief of A in that B will behave dependably for a specified period within a specified context.

In the eVoting domain, A is the voter, B is the eVoting system and X is the eVoting service. Most importantly, by *dependably* we will imply ensuring the following basic requirements (which apply to both eVoting and conventional voting): *democracy* (only voters who have the right to vote can vote and one vote per voter is included in the election outcome), *accuracy* (the election outcome is correct and includes all valid votes), *secrecy* (a voter's vote cannot be seen by any other voter),

receipt-freeness (no evidence is given to the voter that can be used in order to disclose his/her vote to another party), *uncoercibility* (protection from outside enforcement of opinion), *fairness* (the outcome of the election is made public only after all votes have been received and tallied), *verifiability* (all critical stages of the election process are logged for auditing and the election outcome can be verified by the voters), *verifiable participation* (the participation of a voter can be checked by the election authority, in cases where voting is compulsory), and *robustness* (the election process cannot be hindered either accidentally or on purpose by outside intervention). Given these definitions, we can define the means by which the trust prerequisites, i.e. the word “dependably” above, can be satisfied:

Trust management/engineering is a unified approach to interpreting, specifying and incorporating security requirements in a transparent way that allows direct authorization of security-critical actions on behalf of the user.

Thus, this applied view of trust, as pertaining to the eVoting domain, is a property of an eVoting system that emerges in citizens’ minds as a result of a systematic process and manifests itself in their will to use the system in order to participate in an election. This emergence is made possible through the proper trust engineering approach. This approach has been applied to the design and development of the eVoting system described below.

3 The Trust-Centered Approach

Our approach relies on two general methodologies and one cryptographic eVoting protocol. The two methodologies are the *layers of trust decomposition* of a system (see [12], [13]) and the *CORAS risk assessment framework* (see [22]). The eVoting protocol is the protocol described by Warren Smith in Section 7.3 of [20] which is based on the homomorphic properties of the El Gamal encryption function (see [14] for details on this function). Below we will provide a brief account of these three elements, which are shown in Figure 1.

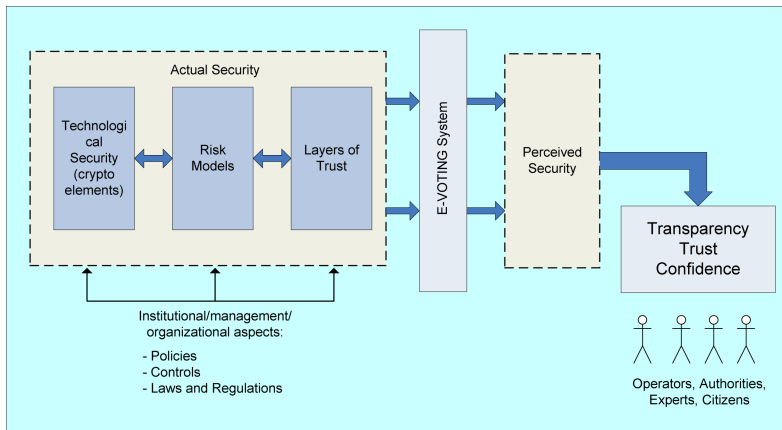


Fig. 1. The trust-centered approach

3.1 Layers of Trust

The layers of trust view of the eVoting system is a view complementary to the other formal views and models of ordinary IT systems (e.g. business view, technical view etc.) and is employed in order to handle the complexity of the security issues pertaining to eVoting, as defined by its security requirements. This complexity can be as high as the complexities that arise in other architectural views of such systems and the layers of trust approach can be used as a tool for managing these issues successfully.

The role of the layers, and the correspondence to the e-voting system, is as follows:

1. *Scientific soundness*: All the components of the system should possess some type of security justification and be widely accepted within the scientific community. This layer corresponds to the selection of a cryptographically strong eVoting protocol, based on provably secure cryptographic primitives, such as the El Gamal encryption scheme and zero knowledge proofs.
2. *Implementation soundness*: A methodology should be adopted that will lead to the verification of the implementation of the separate system components as well as the system as a whole. In addition, such a verification methodology should be applied periodically to the system. This layer corresponds to the adoption of the CORAS methodology (see below) for designing and building the eVoting system.
3. *Internal operation soundness*: The design and implementation should offer high availability and fault tolerance and should support system self-auditing, self-checking, and self-recovery from malfunction. Interference from the inside with the normal operation of the system should be, ideally, impossible to accomplish and, if ever accomplished, it should be readily detectable. The employment of the cryptographically secure eVoting protocol involves the use of proofs of correctness for all the executed steps.
4. *Externally visible operational soundness*: It should be possible for everyone to check log and audit information at some level. The employed cryptographic protocol employs a number of publicly accessible bulleting boards where information is appended concerning the votes cast as well as the proof that the votes were taken into consideration for the computation of the vote outcome.
5. *Convincing the public (social side of security)*: It is crucial for the wide acceptance of the eVoting system that the public will trust it when it is in operation. This trust can be, in general, amplified if the eVoting authority publicises the details of the design and operation of the eVoting system to the public. There is provision for publicizing all the details of the system architecture and implementation as well as provide the software source code for scrutiny. In addition, in order to facilitate the system's wide acceptance, the first trials will be conducted on a voluntary basis with closed groups or local associations, whose opinions can be easily gathered and analyzed.

3.2 Choosing CORAS as the Risk Assessment Framework

CORAS is a framework that permeates the design process in all the layers described above and aims at the precise, unambiguous, and efficient risk assessment of general

security critical systems, during their design, implementation and operation phases. The framework focuses on the integration of viewpoint-oriented UML-like modelling in the risk assessment process. The integration of this state-of-the-art modelling technology in the risk assessment process - referred to as model-based risk assessment - is motivated by the need for cost reductions, efficiency improvement and improved quality of risk assessment results. To achieve its goals, CORAS employs a variety of risk analysis methods, including failure modes, effects and criticality analysis (FMEA/FMECA), fault tree analysis (FTA), Hazard and operability analysis (HaZOP), Cause Consequence Analysis (CCA), Markov analysis etc. In addition, CORAS can produce detailed system documentation and a system security policy based on the outputs of the tools that it employs. This documentation can be publicized in order to increase the transparency of the implementation process of the eVoting system leading, thus, in its wider acceptance by technical and non-technical people alike. Moreover, this documentation provides an open view of the system to the public, in contrast with most “closed-design” commercial eVoting systems.

There is a number of other general approaches to model-based risk assessment include, for instance, CRAMM and Common Criteria among the most widely used ones. The particular angle of the CORAS approach with its emphasis on security and risk assessment tightly integrated in a UML and RMODP is however new. In particular, the issue of maintenance and reuse of assessment results has received very little attention in the literature. Since 1990, work has been going on to align and develop existing national and international schemes in one, mutually accepted framework for testing IT security functionality. The Common Criteria (CC) [10] represents the outcome of this work. The CC is generic and does not provide methodology for security assessment. CORAS, on the other hand, is devoted to methodology for security assessment. Both the CC and CORAS place emphasis on semiformal and formal specification. However, contrary to the CC, CORAS addresses and develops concrete specification technology addressing security assessment. The CC and CORAS are orthogonal approaches. The CC provides a common set of requirements for the security functions of IT systems, as well as a common set of requirements for assurance measures applied to the IT functions of IT products and systems during a security evaluation. CORAS provides specific methodology for one particular kind of assurance measure, namely security risk assessment.

The *Risk Analysis and Management Methodology* (CRAMM) was developed by the British Government’s Central Computer and Telecommunications Agency (CCTA) as a structured and consistent approach to computer security management (<http://www.cramm.com/>). The UK National Health Service considers CRAMM to be the standard for the risk analysis of information systems within healthcare establishments. CRAMM is an important source of inspiration for CORAS, and aspects of CRAMM have been incorporated in CORAS. Contrary to CRAMM, CORAS provides a risk analysis process in which modelling is tightly integrated with the process, not only to document the target system, but also to describe its context and possible threats. Moreover, CORAS employs modelling to document the results from risk analysis and the assumptions on which these results depend.

3.3 Voting Protocol

With regard to the eVoting protocol that is employed, it is based on strong cryptographic primitives, including zero-knowledge proofs that, essentially, provide the guarantees (without violating the vote secrecy requirement) that votes are correctly received and included in the voting outcome. The protocol (see Section 7.3 of [20]) is based on multiparty computations and threshold cryptography, involving mutually distrusting agents who control the voting process.

There are four main entities involved in the protocol: the *Election Authority*, the *Voter*, the *Key Holders*, and the *Bulletin Boards*. The Election Authority is responsible for interacting with the Voter in order to obtain his/her vote in encrypted form. The encryption uses a publicly known key that is formed by the Key Holders using a jointly computation on their private keys. The encrypted vote is then re-encrypted with the authority's secret key, to prevent disclosure of the vote from the voter (e.g. for selling the vote). At the same time, the Election Authority provides the voter with zero knowledge proofs for the vote's re-encryption validity/integrity while timestamping the vote in order to allow the voter to cast multiple votes, with only the last vote being the one that will be included in the vote count (so as to avoid vote coercion). The Bulletin Boards are employed for making available to the public all the details of the interaction between voters in order to support a voting process with all information flow transparent and readily available to all involved parties.

The protocol, as described in [20], leaves many implementation issues open, for which our project team should make choices as early in the project as possible. Although some of these issues have not been determined yet completely, some decisions have already been made. For instance, all Voters should go through an initial stage of registration and authentication using a PKI (either an already established PKI or one operating for the election alone). The Voters are allowed to be authenticated using a simple username/password combination, a smart card or a secure hardware token. In addition, the Election Authority actually monitors and controls a number of distributed local authorities that form a network of vote gathering and processing elements operating in parallel and in a high availability, replicated configuration. Also, the Key Holders are implemented using a number of strong cryptographically secure random number generators (both hardware and software) that form their keys privately (on separate machines) and then perform a secure distributed computation on their private keys in order to produce the election key. Timestamping is also an important, as well as difficult to handle, issue. Our project is considering a number of solutions, including the employment of reputable timestamping service providers or even GPS timing information (obtained by all distributed authorities independently). All the design and implementation details will be made available in a future report of our project.

With regard to our eVoting project status, it is in the detailed design phase. The architectural design and the first steps of the CORAS methodology have been accomplished in conjunction with the system decomposition into the layers of trust, currently focusing on the scientific soundness layer (eVoting specific protocol).

4 Architectural Aspects

In this section we will provide a high level view of the architecture of the eVoting system that is based on the approach outlined in Section 3.

In Figure 2.a we see the overall system's architecture. It consists of a number of *local Election Authorities* (local EAs), which control the election process at a local (e.g. municipality) level, a *central Election Authority*, which controls all the local EAs and verifies their operation, a *VPN over the Internet* that handles the communication among the EAs and the *clients*, which are the computers accepting the votes. In the same figure, also appear the entities that may attempt interference with the system since, by taking the worst case scenario, we assume their existence and their will to attempt disruption of normal operation.

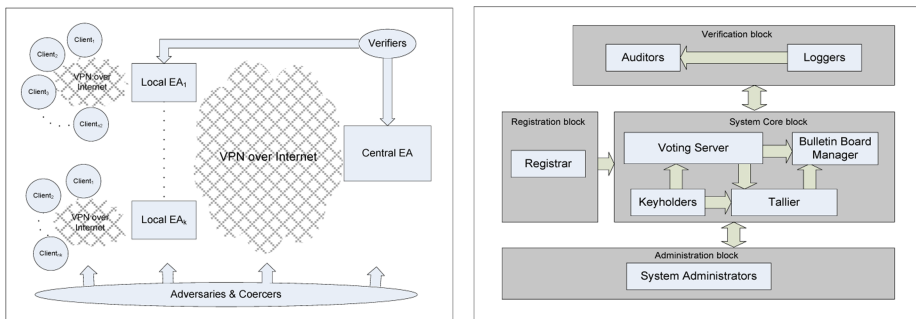


Fig. 2. (a) The distributed architecture of the eVoting system (b) The EA block

In Figure 2.b the components of an EA are shown. Each EA implements, at its core, the eVoting protocol described in [20], which has guaranteed strong cryptographic properties. The components of an EA are the following (most of which directly dictated by the protocol): the *registrar*, which is responsible for checking the voter's eligibility through a connection to a database server containing the id's of eligible voters, the *voting server*, which accumulates and verifies the votes sent by the clients over the VPN, the *key holders*, which cooperatively provide the critical vote encryption key, the *tallier*, which sums the votes and provides the election total, the *bulletin board manager*, which makes publicly available proofs that all votes are taken into account unchanged, the *loggers*, which store critical information about the election process, and the *auditors* which use the information stored by the loggers in order to provide publicly verifiable proof of correctness of the election process. Finally, there is the system administration block that is responsible for the configuration, initialization and coordination of all the other blocks.

As an example of the application of CORAS in the design phase, the Table 1 below shows a fragment of the security critical assets we have identified using HAZOP:

Table 1. Security critical assets of the eVoting system identified by HAZOP

Asset	Description	Entities Involved
Voters List	Contains the voters which are eligible to vote.	EA
Candidates List	Contains the candidates' credentials or alternatively the offered choices for a referendum.	EA
Voter Credentials	The information required for a voter to be identified and authenticated by the eVoting system.	EA, EA _i ,Voter
Configuration Files	Contains information that defines issues such as the opening and closing time of the voting process, the ballot format, etc.	EA, EA _i
Voting opening and closing announcements	Messages that control the opening and closing of the eVoting.	EA, EA _i
Random generated numbers used in key generation	Numbers that must be provably random.	EA, EA _i , Voter
Encryption/Decryption Keys	Decryption and encryption keys must be produced under strict integrity constraints. Decryption keys must remain secret, safe and unaltered throughout the whole eVoting process.	EA, Key holders
Empty ballot form	The form that a voter must fill in order to submit a vote.	Voter
Encrypted and Re-encrypted vote	The message containing the vote is sequentially encrypted by the voter and the EA _i , and consequently verified by both for its integrity and time of submission.	Voter, EA _i ,
ZKPs	Most of the entities in the system provide Zero Knowledge Proofs in order for their actions to be verifiable.	Voter, EA _i , EA, Key holders

Table 1.*(continued)*

Asset	Description	Entities Involved
Multiple votes	The proposed eVoting system supports the submission of multiple votes per user. Only the final vote is valid.	Voter

With regard to the implementation choices, we have adopted the use of as many free and open source libraries as possible. Our choices include the Java programming language, the use of the Bouncy Castle Java crypto library (<http://www.bouncycastle.org/>), Open VPN (<http://openvpn.net/>), OpenCA tool for building PKIs (<http://www.openca.org/>), and the use of the PostgreSQL (<http://www.postgresql.org/>) data base. This ensures that the system's software can be independently audited and verified by any interested third party (government agencies, expert groups, researchers, industry etc.).

5 Conclusions

In this paper we have described a framework that can be applied to the design and implementation of eVoting systems in order to achieve increased trust from the citizen's side (perceived security). This approach relies on the layers of trust decomposition of the system, on the CORAS risk management methodology and on the choice of cryptographically strong eVoting protocols. The goal of the layers-of-trust approach is, mainly, to handle in a structured way the complexity of the security issues that beset all security critical applications. The focus is on designing and building the application in a transparent way that produces a sufficient and verifiable security level at each layer, able to establish and maintain trust in all involved agents: technical people, government and the people who will use the system. The goal of the CORAS methodology is to assure that all threats to the system are discovered in time, before the deployment of the system, and to provide sufficient documentation of the system that can be made publicly available. Finally, the cryptographic protocol (any other protocol could be used in its position) assures that all the basic requirements of eVoting are secured, at least in principle.

We believe that this "three-pillar" systematic approach can lead to the design and development of eVoting systems that can "prove themselves" in the citizens' eyes providing evidence for their reliable and secure operation. Of equal importance to the wide acceptance of the system, is the demonstration of its secure operation within the context of elections within small, closed groups on a voluntary basis and a gradual deployment to a larger scale.

We should, however, stress the fact that our approach to trust does not cover non-engineering issues. For instance, our approach does not address the issue of how a citizens' right to verify that his/her vote was included in the final voting result can be exercised, although there is some piece of evidence (digital or paper-based) that is provided to all voters that can be potentially used for verification purposes. We believe, however, that the proposed approach could be extended in order to address all

these issues (such as, for instance, by appointing external system and eVoting process evaluator experts), beyond the engineering level, in order to enable citizens reach a trust level similar to the trust level enjoyed by the conventional voting procedure.

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E-Voting: Usability and Acceptance of Two-Stage Voting Procedures

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Abstract. Two-stage voting procedures, where registration for voting and actual vote casting are separated, are considered a viable way to ensure voter secrecy and anonymity in casting votes. This, however, comes at a price; a media has to be constructed to bridge these two phases and to ensure that the media cannot be abused. This contribution reports about an e-voting test among Austrians abroad conducted in 2006, which focused on the usability issues of such two-stage procedures.

Keywords: E-voting, pilot project, usability, e-democracy.

1 The Issues

Any electronic voting system has to ensure that General Voting Principles [1] are met also in the electronic media. “Electronic voting” in this context refers to remote voting using the Internet, voting machines and terminals are not an issue in this paper. A main requirement in these Principles is voting secrecy, which can be decomposed into two more specific requirements: (i) Secrecy in the act of filling in the ballot and (ii) preservation of anonymity once the vote has been cast. The first requirement is difficult to meet, as is the case with postal voting¹, the second is a standard requirement for a remote e-voting system (a complete requirement specification can be found in the Recommendations by the Council of Europe in [2]). A way to ensure such anonymity is to technically separate the identification phase and vote casting phase and to use a medium, a voting token or “electronic voting card” to bridge this gap. Voters register and obtain a voting card, which is then used later to cast a vote. Apart from the anonymity issue, this procedure generally has several advantages: (i) Voters already used to postal voting procedures with registration will also find the pre-registration process in e-voting familiar; (ii) Conventional voting channels will of

¹ There are, however, considerations to reduce if not eliminate the possibility of undue influence in filling in the ballot sheet including multiple votes, where later ballots replace the older ones (for the Estonian example of such procedure, see. [3]).

course continue to exist. Hence, double voting must be prevented; the registration period for e-voting may end a few days before election day to enable the Election Administration to print voter rolls for the polling stations discounting all voters who registered for e-voting (or postal voting) before. This ensures that polling stations must not have online access to a central voter register as nobody may cast a vote electronically who has not registered for e-voting before. This simplification does not just make e-voting cheaper, it also makes the entire system more robust and reliable. To see that, imagine an e-voting system without registration, where voters decide on Election Day which voting channel they want to use; every voter entering a polling station has to be checked against the central roll. What would be the procedures, if connection to the central roll was lost?² These reliability concerns were one of the main reasons why the use of voting terminals and online access in polling stations was definitely excluded for Austria at least on the Federal level [15].

However, two-stage e-voting comes with a substantial drawback: Upon registration the voter has to be provided with a voting token that (i) cannot be forged, (ii) cannot be traced back to the voter and (iii) that can later be used to cast a vote on Election Day. The first two points have been addressed by the literature. It was shown that protocols based on Chaum's blind signatures [5] fulfil the non-traceability requirement [6], and that other requirements, such as non-manipulability of the assigned constituency or server administration fraud can be addressed satisfactorily [7]. But beyond the technical issues the question remains, whether the users would accept such procedures and would be able to easily handle the voting token:

- (i) Unlike paper documents an electronic voting token may be duplicated at will and one cannot distinguish between original and copy. Hence, the token may be used several times to cast a vote.
- (ii) The token could be abused by someone other than the authorised voter.
- (iii) The token and its function has to be explained to the voter.
- (iv) The token could be lost.
- (v) The token has to be stored as a file, where particularly inexperienced users may find it difficult to manipulate the file and find it again.

The solution to the first issue is to build an index over the database field in the electronic ballot box and to ensure that every token is stored but once. The ballot can also be inextricably linked to that token (for a mechanism see [8]). The solution to (ii) is to symmetrically encrypt the token with a password chosen by the voter and which only the voter knows. This of course presupposes decentral processing capabilities, such as a Java applet, to perform the function. In conventional server-based Web pages, the server would "see" the token in its unencrypted form and could hence break anonymity. Without the password the token cannot be reconstructed and hence

² An elegant way around this issue was chosen by the Swiss e-voting system [4], where postal voting documents are sent to the voters without special application; the voter may use this voting title document ("Stimmrechtsausweis") to send in a postal vote or to cast a vote in a polling station as long as the e-voting TAN on the document is still covered. However, this solution is possible because *all* voters receive postal voting titles by default and little additional costs are involved to send the TANs as well. Otherwise the costs of specific postal communications can be expected to be substantial (for an estimate cf. [16]).

cannot be used to obtain a ballot sheet. This also provides a solution to the loss of a token: The token may be submitted to the election server and retrieved if it is lost by the voter. Due to the decentral encryption even the election server administration could not open and meaningfully use the token file.

But beyond these technical solutions the question remains, whether the entire handling is transparent and manageable to the average computer user. This was a main focus of the e-voting test jointly conducted by Wiener Zeitung, the Official Journal of the Republic of Austria that also offers a range of e-government services, and the research initiative e-voting.at at the University of Economics and Business Administration Vienna.

2 The Implementation

2.1 The General Process

Registration for the test was possible between 25th Sept. 12am to 11th Oct. 2006 12pm (for a detailed report, see [13]). Since the test was non-binding, user authentication was based on a self-registration process (see R1 and R2 in Fig. 1; the notation follows Event-driven Process Chains by Scheer [10]). The self-registration was handled by an add-on to the voting system itself and every user that filled-in the form was passed on to the e-voting system as authenticated. In a second step, the e-voting Web application client generated for each participant a large random number that was used as a voting token. The token was submitted to the election server to be signed blindly.

Furthermore, the verifier, an independent module, also blindly signed the same voting token, which prevents the administration of the e-voting system from forging voting cards. In this test, the verifier was located on the e-voting server, however, the verifier may also be located on a separate machine. Both signatures used 1024 bit RSA keys (see R3-R6 in Fig. 1).

After receiving the signed voting card from the e-voting server and the verifier, the client removed the blinding layer (R7) and the voter possessed a voting token authentically signed by both the e-voting server and the verifier that cannot be traced back to the client or to the voter. The voter was also required to choose a password to encrypt the voting card (128 bit AES [9]) and to save it on a storage media (hard drive, USB stick etc.) of his choice. The encryption was done decentrally on the voter's PC, hence, only the voter may open and use the voting card (R8). To solve the issue of lost tokens, the voter was offered an option to keep a backup copy of his encrypted voting card on the e-voting server. In case of loss, the e-voting helpdesk support would be able to send a copy of the voter's voting card to the voter. This recovery mechanism for voting cards is a main advantage in comparison to paper-based voting cards (R9-R12 in Fig. 1). Voting took place between 12th Oct. 12am and 14th Oct. 5pm. Using the e-voting Web client the voter read the voting card and entered his personal password, which was used to decrypt the voting card (V1-V3 in Fig. 2). After successful decryption, the voting card was sent to the e-voting server for authentication, where the signatures of the e-voting server and the verifier has not yet been checked (V5-V8). Upon successful authentication and if the voting card has not yet been used, the voter received the ballot sheet and was able to cast a vote (V9-V15).

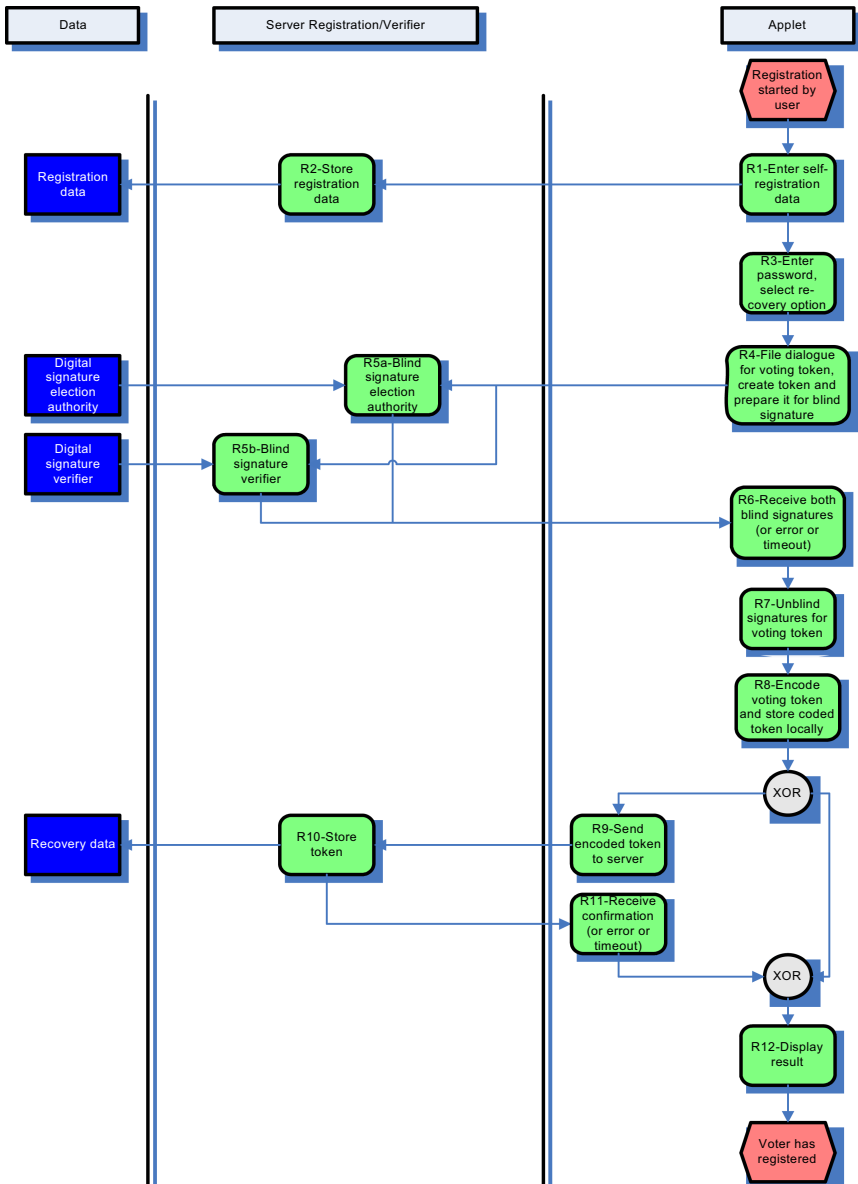


Fig. 1. Registration process

2.2 Usability Lab

The research initiative e-voting.at had already conducted two tests in 2003 [11] and 2004 [12] among students, however, this was the first test among a general audience. Hence, the application was tested in a usability lab conducted with 16 test persons.

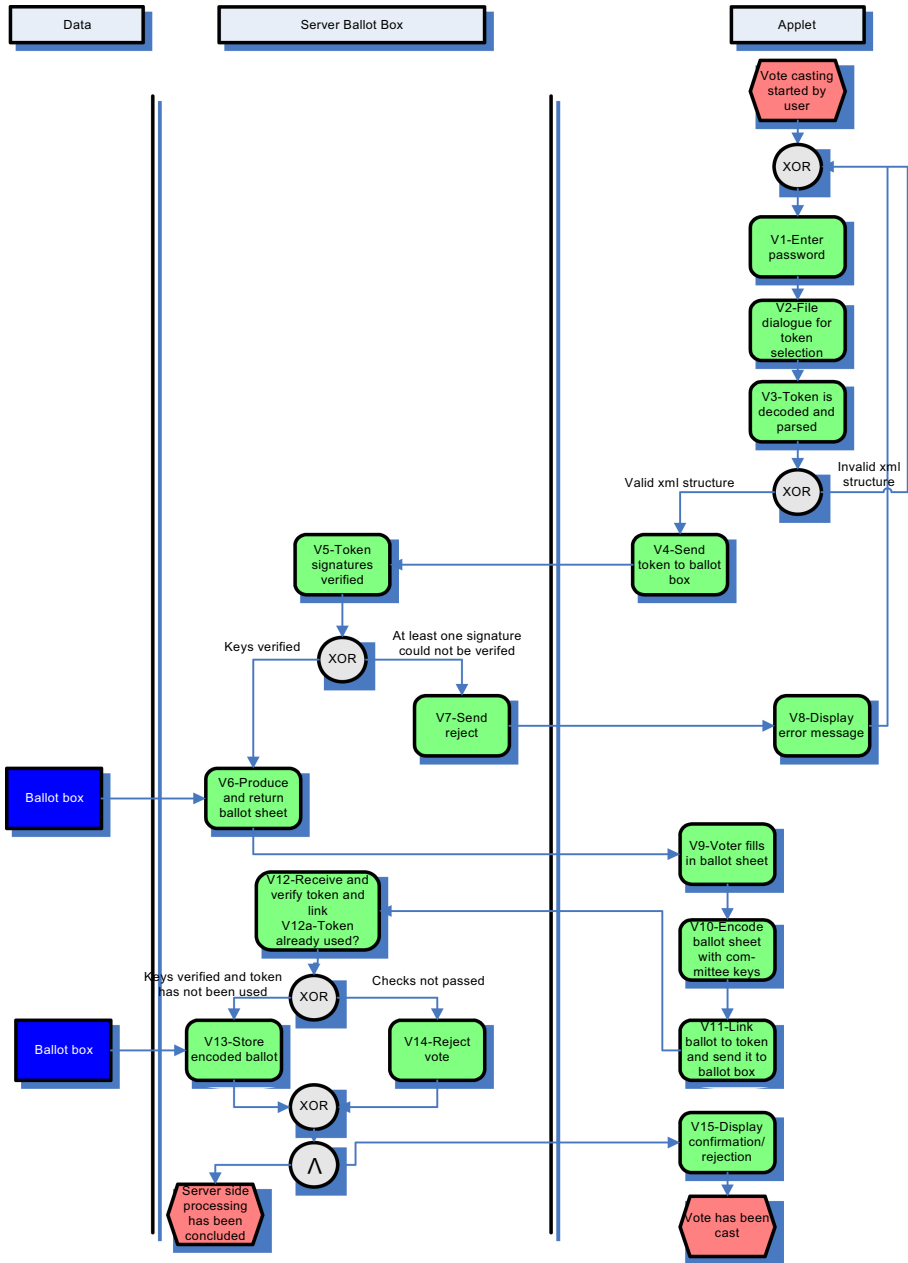


Fig. 2. Voting process

The target group for the usability test were standard users with basic to medium Internet and PC skills. As Table 1 shows, disproportional emphasis was put on members of the higher age groups.

Table 1. Demographic factors in the sample

Age	%	Education	%	Gender	%
15-19	0%	Compulsory school	13%	Women	56%
20-29	19%	Apprenticeship	38%	Men	44%
30-39	6%	Vocational school	0%		
40-49	13%	Secondary school	31%		
50-59	56%	University	19%		
>60	6%				

Table 2. Usage of help information

Help page	%	Pers.	Technical explanation	%	Pers.
Read helppages	0%	0	Read technical explanation	6%	1
Short look	63%	10	Short look	31%	5
Did not use help page	38%	6	Did not read	63%	10

Before the test started the subject was given a short explanation about e-voting and where he or she could find the web site. There was no interaction between observer and test person during the test.

Particular emphasis was put on providing adequate help and background information on the test; the Web page is still available at www.e-voting2006.at. It consisted of help information for registration and vote casting including screen cam shows for both steps and technical background information relating the steps in the user interface to the technical process. Particularly the background information on the voting token and help in regards to file handling were topics for help information. Results however showed that the users took hardly any notice of the help information. This result was corroborated by the user survey after vote casting (see Section 2.5). The obvious solution is to integrate help information “just-in-time” when it is needed in the process, however, this may conflict with the aim of minimizing the user interface and user interaction when the person votes. In the registration process, the user had to indicate a password for token encryption, to go through a standard file dialogue to specify the file name and location for the token file and to select whether to use the recovery option (R3 and R4 in Fig. 1). In the usability lab, two users had problems with the minimum password length (8 characters) required. In response to this issue, additional information was included on the password entry screen in the revised version. The same applied to the recovery function, which was not understood by four test persons; also here, more information “on the spot” was added. All test persons, however, understood and were able to successfully handle the file dialogue.

In order to have a more realistic setting, a break was made after registration. The first step in vote casting was to enter the voter password for decryption of the token and to go through a standard file dialogue to specify the token file (V1 and V2 in Fig. 2). Four Persons had issues with entering/remembering the password. To facilitate user handling, failure to correctly parse the voting token resulted in positioning the user once again in the password entry screen at the beginning of the process because the system cannot ascertain, why decryption of the token file did not result in a valid token: Either the password was wrong or the file was corrupted or

wrong. It was generally expected that finding the voting token in the file system again would be a major issue for most inexperienced users. However, only one test person had problems finding the voting token. Also during the test itself, this was not an issue.

2.3 Helpdesk Calls

Participants could address their requests to an email-based support during registration, whereas additional phone-based help was offered during vote casting. In the test, 293 persons registered and 148 persons actually cast a vote. All told, Helpdesk logged 19 requests; the requests associated with the two-stage process and token handling are listed below: 2 users forgot their passwords: In this case Helpdesk could not help in any way, as it is the very intention of the mechanism to stop anybody other than the voter himself to gain access to the voting token. In 2 other cases, it could not be decided whether the token file had been damaged or the voter had forgotten the password. Since both had chosen the recovery option, the token was sent to them (no further communication was received in either case). 4 persons tried to view the token by double clicking on it, which, of course, did not work, as there is no application linked to it. In fact, the token is a simple text file containing the result of the symmetric encryption process in text form (hexadecimal character set). It can be viewed with any text editor, such as Windows Notepad. The wording used for the voting token was “elektronische Wahlkarte” (electronic voting card), which may have led users to believe that, if opened, it would display some sort of text or an emulation of a paper-based voting card. In fact, the voting card was a signed bitstring that only fulfilled the function of a voting card. This obviously has to be better communicated to the end user.

2.4 Usage of the Token Recovery Function

By default, the option was de-selected and one of the prime questions of this test was, whether the recovery function would be understood, trusted and actively used. 153 out of 293 participants selected the recovery, which is 52%. This shows that the recovery function meets a real need and is accepted by the users of an e-voting system. Interestingly, none of the users during the test seem to have had any difficulties understanding and using the recovery function, as there were no requests in this regard. Two persons actually used the recovery function, in that the encoded voting token was sent to their specified email addresses. In a paper-based mail voting process, the voter would have lost his opportunity to vote.

2.5 User Survey

After vote casting participants received a Web questionnaire (an add-on the user was redirected to after the ballot was submitted) to ask about their user experience in registration and voting. 114 users participated in the survey and submitted a questionnaire, all questionnaires were complete. The results are depicted in Table 3; since the original questions were in German, an English translation is provided here. 4 Questions offered the usual Likert scale from strong agreement (1) to complete disagreement (5). One question involved a yes/no answer.

A caveat is of course indicated: This survey was filled in by those participants who eventually cast a vote. The figures would not show an interested user, who tried but failed to use the system and hence did not reach the point where the questionnaire could be filled in. However, there is no indication that such cases existed in large numbers because it can be expected that at least some of them would have contacted Helpdesk, which did not occur. Also, in spite of certain user issues, all participants in the usability lab managed to cast a vote and to follow the entire process without any help.

Table 3. Results of the survey

Question (Engl. translation)	1	2	3	4	5	Sum
The registration for the e-voting test was easy to use	51	46	10	5	2	114
	45%	40%	9%	4%	2%	100%
The vote casting was easy to user	62	33	12	6	1	114
	54%	29%	11%	5%	1%	100%
Two actions are necessary to cast a vote, to register and to vote. I am prepared to accept this if it is necessary to effectively protect voter anonymity	94	9	4	3	4	114
	82%	8%	4%	3%	4%	100%
I am confident that the system correctly records my ballot and protects my voter anonymity	48	30	22	9	5	114
	42%	26%	19%	8%	4%	100%
	Yes	No	Sum			
I have used the help pages and the information on how the system works	48	66	114			
	42%	58%	100%			

As can be seen, 85% and 83% (strongly) agreed that registration and vote casting of the prototype was easy to use, resp. This would also indicate that the improvements to the software, which emerged as a result of the usability lab, did improve the software user interface. 90% of the participants are prepared to accept the extra step of a two-stage voting procedure and the file handling of the token associated with it, providing it is necessary to ensure anonymity of the vote. This is an encouraging result that also shows that there is some security consciousness among potential e-voting users. Even though this is not within the scope of this paper, it is interesting to note the results to the fourth question: Only 68% of the participants (strongly) believed in accuracy and secrecy of the prototype system, 12% had serious concerns. This is a clear that these concerns must be taken seriously. To deal with them successfully, several measures will be necessary: (i) The utmost transparency concerning the underlying processes and safety measures; (ii) A security analysis and a respective certificate from a recognised certification authority using a Common Criteria evaluation level [14] that also involves source code inspection; (iii) The digital signature of the source code ensuring the voter that the checked and certified source is also the source downloaded to his Web browser.

3 Lessons Learnt

The test clearly showed that two-stage voting procedures are acceptable to potential users providing it is necessary to ensure the secrecy of the vote. The general process involved was understood.

The file handling involved (password protection, saving file, retrieving the protected token) was understood and even inexperienced users were able to cope with it.

The recovery was understood and, moreover, met a real demand by the participants.

Apart from a general help page that also provides technical and procedural background information, the relevant help information must also be provided “on the spot” during the process. This has to be aligned with the requirement to have a parsimonious user interface during the election to avoid security issues and undue distraction of the voter.

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Design and Metrics of a ‘Democratic Citizenship Community’ in Support of Deliberative Decision-Making

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Abstract. The participation of citizens in government issues can bring to life the principles of democracy, making use also of the electronic channels. However, when the citizens are asked to participate in consultative and deliberative processes, they individually receive information from different communication media. Thus, it is not possible to verify whether the individuals have reached maturity in the issues discussed on the Web. The purpose of this paper is to show our proposal to evaluate the degree of maturity during the democratic decision-making process on the Web, engaging citizens by using a virtual community. The ‘Democratic Citizenship Community’ (DCC) was specified based on an investigation of a Government-Citizen Interaction Model, oriented toward discussion and voting. The Degree of Maturity Method (DMM), used to evaluate the DCC, is structured into levels: Immature, Poorly Mature, Mature and Sufficiently Mature, using a set of metrics to verify the effectiveness of the e-Participation process.

Keywords: e-Participation, e-Democracy, deliberation, community, decision-making.

1 Introduction

In a democracy power can be exercised by many, it is the people’s expectations that prevail in all political decisions. The participation of citizens, in particular, can make democracy feasible, since it generates a continuous flow of information between the citizens and the government, assisting both in the decision-making process. Electronic democracy (e-Democracy) can facilitate such an enterprise, promoting the discussion of specific subjects or issues, or helping in decision-making. It means that the citizens reflect on social conditions and express their opinions in ongoing debates through the use of Information and Communication Technologies (ICTs) [22].

But can the democratic process become electronic just by changing the way services are rendered by the government? Typically, the development of e-Democracy has followed a relatively predictable model [24]: the organizations offer information and add services, then embark on attempts to add e-Participation tools. The implementation of true e-Democracy requires a careful and comprehensive methodology to secure the construction of an effective infrastructure that will encourage ease of use and,

consequently, citizen participation in decision-making. It is interesting to see the initiative of many governments to promote digital inclusion, providing the actual physical infrastructure, but does not necessarily guarantee participatory decision-making. Development of e-Democracy programs by governments will require significant human and financial resources to conduct e-Voting and e-Consultations [20].

It has become clear that countries are at a nascent stage of development of e-Democracy [20]. Distinct methods to promote citizen participation in decision-making can be adopted by countries, including referenda, public hearings/inquiries, public opinion surveys, negotiated rule making, consensus conference, citizens' jury/panel, citizen/public advisory committee or focus group [21]. In Brazil, the democratic regime is essentially representative, as government representatives are selected by way of elections. Direct manifestations of people's sovereignty, according to the Constitution of the Federative Republic of Brazil, include referendums, plebiscites and citizen initiatives. Other government entities in different fields, e.g. collegiate bodies in education, include small groups of representatives which are selected by a larger group in order to decide on specific matters.

Despite various available e-Participation applications with different goals and with distinct tools on the Internet [6][13][24], generally speaking, consultative processes have taken place via e-mail, chat or discussion forums, although these can present problems with regard to discussion structuring and information retrieval. Deliberation takes place separately through surveys often exploring general topics without generating a preliminary discussion of such topics.

Considering the studies related to the use of ICTs in the consultative and deliberative processes on the Web [6][13] and the deficiencies presented by some of these tools, as well as the existence of strategies used by the traditional medias to attract the participation of the public, the measure method and a model to support the Government-Citizen Interactive Model is proposed [13]. To engage citizens, a virtual community to interact on governmental issues, a 'Democratic Citizenship Community' (DCC) is created. Because of the importance of ease of use, the DCC wireframes are discussed in this paper. With a DCC we intend to engage citizens and to investigate whether they develop maturity for the decision-making process. We believe that if the consultative and deliberative processes are integrated within the same communication media (in this case, the Internet) it becomes possible to measure the degree of maturity in decision-making. The Degree of Maturity Method (DMM) proposed is structured in four levels: Immature, Poorly Mature, Mature and Sufficiently Mature. In order to measure the DMM using these levels, we use a group of indicators, suggesting metrics and classifications useful for the subsequent construction of an evaluation tool.

2 Virtual Communities and Decision-Making in E-Democracy

The Virtual Communities (VCs) are an extension of the communities in the real world. However, there is not a direct relation with the geographic localization of the involved members, but a union for common interests. The challenge in using virtual communities is that they are not always capable of keeping the same level of collaboration, motivation and involvement of the real communities.

A virtual community must possess four elements that characterize [8]: the clear definition of the group; the interaction between the members; the linking between the members, and the exchange of information in a common place.

Several methodologies have been proposed for studies of the VCs [4]. According to de Souza and Preece [4], although the interest for online communities continues to grow it is questioned what distinguishes the successful communities, in which there exists a constant flow of messages, from those with few or no activity. Little attention is given to the evaluation of online communities, and even successful books do not list evaluation or tests in their summaries [10][16][18]. Other researchers have tried to adapt the evaluation by using metric systems of Human-Computer Interaction [4][17]. Researchers and developers of online communities are most worried in trying to understand the dynamics of the communities online [11] [17][19].

Developers of virtual communities must simultaneously deal with communication, motivation, leadership, and technology [11]. Regarding communication, these authors comment that posting and viewing are fundamental elements in the ongoing life of any virtual community. Motivating members who are physically dispersed to actively participate in their community is difficult. Another factor is that a lack of social presence creates communication weakness in any virtual community. Social presence is critical for effective communications in many social/work contexts, because this indicates the degree to which the medium facilitates awareness of other people and interpersonal relationships during an interaction [5]. According to Nielsen [14], in most virtual communities, 90% of users are lurkers who never contribute, 9% of users contribute a little, and 1% of users account for almost all the action. It is also difficult for community leaders to reach a consensus on common goals or interests among heterogeneous community members in terms of age, education, and profession [1][11]. Technical factors, such as stable IT-infrastructure and software that promotes discussion, can stimulate member participation [7].

In a preliminary analysis of 47 governmental and non-governmental communities available on the Internet, of national and international levels, distinct areas of performance had been identified (for example: government, entertainment, relationship and businesses). Such communities make use of resources for interaction with and between the users, making possible a diversification of actions. Recent researches on ICTs in Brazil pointed the interest in VCs (46,57% of use) by the Brazilian users [2].

Current virtual communities have many social characteristics, without focusing on democracy, and they fail to encourage citizen participation in the actual decision-making process. The object of our study is to develop a strategy that will ensure and measure the communication between the government and the citizens, allowing deliberation about important social issues. We believe that virtual communities are a successful alternative for Internet interaction between the government and the citizens, as they are socially attractive and support a participatory model for e-Democracy. Determinative factors in the effectiveness of the decision-making process in consultations and deliberations in the VCs had been determined in our research and investigated [13]. According to Riley [20], the question of engaging large numbers of

people in e-Voting and/or e-Participation was the central issue to all of the discussions and plans about the future of e-Democracy.

Decisions are made in response to a problem that needs to be solved, a requirement that needs to be met or an objective that needs to be accomplished. In other words, a sequence of steps or phases succeeding each other and known as the decision-making process. Thus, by focusing on the democratic consultative and deliberative process on the Web we attempt to measure the degree of maturity in decision-making in e-Participation. We propose the Degree of Maturity Method (DMM), initially with four increasing levels:

1. Immature: initial process, unpredictable, conditional on the acceptance of an invitation for participation in the VC. Indirectly, it shows the interest of a given public in a certain theme proposition.
2. Poorly Mature: a participatory consultative process that involves an interest in discussion rather than in voting.
3. Mature: a participatory deliberative process that involves an interest in voting rather than in discussion.
4. Sufficiently Mature: a participatory process, effective and deliberative, whereby the citizen participates in all activities, with satisfactory frequency.

In order to measure each level, we propose some metrics, as presented in Table 1 below. In formal terms, metrics is an indicator or scale that allows us to quantify an attribute of a product of the software development process or the conception process itself. The expression ‘product’ can apply both to requirement definitions and to functional specifications, source code or executable code.

Table 1. Metrics defined initially at define the Degree of Maturity Method on the Web

Levels	Metrics
Immature	Citizen registration in VC; candidacy as moderator
Poorly Mature	Number of postings in the discussion by topic (pro-against); number of justifications posted in the discussion; viewing of community content; performance of moderator
Mature	Participation in voting
Sufficiently Mature	participation in the entire process; use of other spaces (socialization and library); respect the use of rules; trust

In regards to the metrics associated to software quality [9], they include several characteristics, the most popular characteristics being: functionality, reliability, usability, efficiency, maintainability and portability. As the application is intended for the Web environment and given the e-Participation objectives of the research, we will allow accessibility. Another metric to be investigated is sociability, as we are dealing with VCs [18].

How the proposed space is organized around a VC, the aspects of the conception of a ‘Democratic Citizenship Community’ and its structure to support a e-democratic process are argued below.

3 Democratic Citizenship Community

In our research we specify a Government-Citizen Interactive Model [18] structured in phases, and we use DemIL [12], Democratic Interaction Language, the aim of which is to promote discussion and deliberation. The process starts with some definitions by the government such as type of manifestation and calendar (phase 1). To engage citizens we propose the creation of a virtual community for citizens to interact on governmental issues, one that is structured by geographic and thematic categorization of the participants and election of popular representatives, among other things (phase 2). The debate phase (phase 4), in particular, requires structuring to facilitate discussion of the demands (phase 3) and to facilitate Web integrated information retrieval, with qualitative and statistical analysis of data (phase 5). Thus, the posting of opinions forces the citizen to give an opinion, pro or against, on the relevant topic and to justify his/her vote. Then the final voting takes place. The existence and performance of a moderator are also modeled. This facilitates a deliberative strategy whereby the prioritized demands (phase 5) are presented for voting (phase 6). In order for citizens, government and moderators to actually engage in discussion, we propose a DemIL, which can be useful not only for the application proposed here but also for other models of direct participation of the citizens in decision-making.

In the Interactive Model proposed, the modeling of electronic participation takes into account the characteristics of an audiovisual plan. Through discussion we seek a consensus so as to allow informed voting. In this intermediate phase we use some characteristics of techniques for decision-making. For electronic voting, we use some characteristics identified in the format of Reality Shows. Considering previous studies [13] we structure the participation environment according to phases and activities discussed below and with these characteristics.

The study suggested in this work is especially concerned with the phase 2 (virtual community of citizens) of the model, however it integrates almost all the phases. One of the phases defined in the DemIL is data clustering. This phase is not used in the 'Democratic Citizenship Community' (DCC), although the demands could be summarized and later be attached to the result of the deliberation. Through the conception of the DCC it is intended to engage the citizens in the consultative and deliberative processes and to verify if these, in fact, ripen during the process of decision making, in view of fact that he/she will access distinct information and communication integrated to the environment.

The DCC search to guarantee the effectiveness of the e-Participation of the citizens in the consultative and deliberative processes through the following components: a profile of citizens, the register of the popular representatives and/or demands, a component for debate, linked to a library of information, a space of socialization, a component for voting and another one for deliberation.

The components of the DCC have distinct functionalities. The Debate, by methods of manifestation, is organized as proposed in the DemIL [12] that separates the opinions in "agree" and "not agree", with the respective justifications. A stated period is settled for the summarized presentation of the final results for region/thematic, managed by the moderator. After this phase the members are stimulated to vote, in

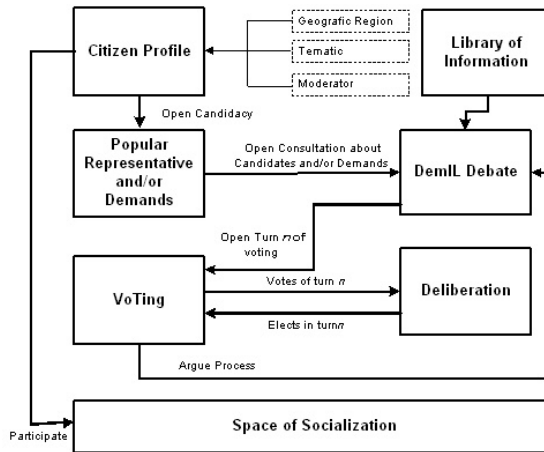


Fig. 1. Democratic Citizenship Community

determined turns, and the results will be tuned available in the deliberation environment. See Figure 1, below.

The stimulation to a effective participation and a continuous process in the community is a challenge [4][10][11][14][15][17][19], emphasized in this research. The effectiveness of the decision-making process in the DCC will be measured through the analysis of the data remover from the environment. With the use of techniques of observation and statistics of use are investigated some metrics as specified in the DMM. At last, through a questionnaire available in the environment, the satisfaction of the participants will be measured. See the methodology proposed in the next section, as well as the DCC project.

3.1 Methodology and DCC Project

The methodology adopted in this research includes both bibliographical and applied research and is executed in four phases, as is generally described in Table 2 below.

Table 2. Research phases, steps and techniques

Phase	Steps	Techniques
Phase I	Conception of Democratic Citizenship Community 1. Conceptual Model of a DCC 2. Interface Project 3. Implementation	1.1. Analysis of domain and user/Scenarios 1.2. WebML diagrams 2.1. Prototyping (Wireframes) 2.2. Prototype evaluation 3.1. Database/Web language
Phase II	Execution of case study: DCC	Use management

Table 2. (continued)

Phase III	a) Definition of indicators to evaluate the degree of maturity in decision-making b) Data analysis 1. Register participants profile 2. Register moderators 3. Postings for discussion (pro and against) by theme/demand 4. Performance of moderator 5. Existence of justification for opinions 6. Participation in the voting by theme/demand 7. Viewing of community context 8. Use of socializing Space 9. Use of library 10. Satisfaction of participants	a) Tool to measure the Degree of Maturity Method - DMM b) Data Analysis 1 to 9: Observation Statistics of Use 10: Questionnaire
Phase IV	Analysis of the DMM regarding DCC	Theory and Practice

This paper aims to discuss with the scientific community some important research strategies adopted in the phases I and III, prior to carrying out phase II and IV.

As regards the Conception of DCC, we are generally investigating:

a) Analysis of domain and user: the public in question is the Brazilian citizen, who is typically a universal user with a range of skills. In order to model the application, we searched the Web for consultative and deliberative environments, analyzing both domestic and international e-government initiatives and, as regards communication, we found some successful interaction techniques. We also consider some successful techniques for securing the quality of a Web application, with emphasis on usability [6], sociability [18] and accessibility [6].

b) Requirements specifications: next we present some requirement specifications to develop the application, which are classified as functional and non-functional. See Table 3.

c) Modeling in WebML: once the information is collected from document analysis, observation of Internet environments and elicitation of requirements, we define the entities and attributes that will compose the DCC database, with the relevant relationships. Besides the database structure, DCC design in WebML [3] still counts on the hypertext model and with the definition of the elements of the graphic interface.

d) Wireframes: to better discuss and model the system we developed wireframes for major DCC interfaces. We place emphasis on this step because the quality of the user interface is of critical importance for the e-Democracy environment. We will briefly introduce some of them. The wireframes were projected in Portuguese Language, considering the case study proposed, in colored interfaces.

With homepage the user can login to the DCC or register as a new user. The opening text informs: ‘Democratic Citizenship Community is a place to discuss matters of common interest which supports voting. Get informed, post your opinion and help decide’. See Figure 2 below. After registering or logging in to the DCC, the user is directed to his/her ‘Profile’, which shows personal information in the form of a

'personal document', and time left before open discussions and voting close, all in an attempt to stimulate the citizen to participate. Figure 3 below illustrates this interface.

Table 3. Requirements specifications of the DCC

Classification	Principal Requirement
Funcional requirements	<p>Allow only registered users to access the system, according to profile.</p> <p>Allow registration of citizens providing name, city, district, identification card number, date of birth (year is optional), experience with computers (beginner, intermediate, expert), occupation, type of involvement (none, follower, volunteer, delegate, consultant, other), telephone (optional), e-mail address, Website (optional), photo (optional) and free text (optional).</p> <p>Allow registration of users, distinguishing between Administrator and Citizen.</p> <p>Allow the administrator to register the type of public manifestation being started (referenda, public opinion surveys, focus group, among others)</p> <p>Allow the administrator to control opening and closing dates for consultative and deliberative processes.</p> <p>Allow registration of regions and districts.</p> <p>Allow registration of thematic groups (Education, Health, Transportation, among others) and/or sub thematic groups, done by the administrator.</p> <p>Allow the user to be a moderator in the discussions.</p> <p>Send e-mails inviting new participants to join in, as done by the citizen.</p> <p>Send e-mails with scheduled dates for citizens to participate in consultative and deliberative activities, as well as the results. Notifying e-mails are automatically sent to citizens. The administrator can register a standard message to be used when sending the e-mail.</p> <p>Allow the administrator to view the history of participants.</p> <p>Allow access to discussions in public mode.</p> <p>Allow profiles to be edited by the user.</p> <p>Allow the administrator to define the number of voting rounds and the number of options undergoing voting (2 or 3).</p> <p>Allow the citizen to register demands and participate in open discussions, according to Thematic and Geographic Categorization.</p> <p>Forbid anonymous postings in the discussions.</p> <p>Allow citizens to view other citizens' profiles, by thematic and geographic category.</p> <p>Allow the Moderator to intervene in the discussions, whenever required, deleting invalid opinions.</p> <p>Provide a key-word search mechanism for searching logged demands and discussions.</p> <p>Provide citizens with a use recommendation system for the environment, with statistics of use by category and by user.</p> <p>Enable citizens to vote after the discussions, with rounds and deadlines predefined by the administrator, given the options available.</p> <p>Each citizen is allowed to vote only once in each discussion, following the round.</p> <p>Provide access to an information library with downloadable files in different formats (pdf, mp3, etc), register links by thematic and geographic category.</p> <p>Provide citizens with an environment for exchange of information, with a coffee-bar, a chat room and a message board.</p> <p>Allow generation of a printable report on the consultative and deliberative process.</p>

Table 3. (continued)

Non-functional Requirement	a) The system should be capable of restoring faults in case form-related problems occur; voting must be secret.
a) Reliability b) Usability c) Portability d) Efficiency e)	b) The system should provide contextual help; the system should have a help menu organized by topic to dispel any doubts users may present; use buttons with visibility when voting; computer-inexperienced users must find the system easy to use and intuitive; in order to effect voting, a confirmation by the user is required; the system should use configuration assistants.
Maintainability f) Accessibility	c) The system will run on Web platform; system data is stored in a database; the information library files must be available in pdf, mp3 and other interoperative formats. d) The system should be available 24/7, following set deadlines; response time should be kept to a minimum. e) The system should be easy to adapt to other applications; the system should be easy to test f) The system should be available to users with special needs.



Fig. 2. DCC Homepage



Fig. 3. Citizen Profile

By using the ‘Discussion’ link the user can pick the demands (topics) he/she wants to discuss, in the relevant location, following theme propositions that are predefined by the administrator (see Figure 4). The latest demands are listed and by accessing them it is also possible to view the opinion of other participants. According to the DemIL language proposal, the citizen must issue a pro or against opinion regarding the theme under discussion and justify his/her opinion. By clicking on the ‘New Demand’ button it is possible to include new demands for discussion in the DCC. Once the desired demand is selected, the citizen decides on his/her final vote, in the ‘Voting’ link (see Figure 5). It is possible to post a justification for the vote and also to view pro and against justifications from other users. During ‘Discussion’ and ‘Voting’, the demands are listed and divided by theme, it being possible to vote for each one of them during the period predefined by the administrator.

The system administrator can register and manage the calendar using the environment’s diary; register standard messages to be sent to citizens, notifying them of process date and final result date; register the regions and theme propositions where consultation and deliberation will take place; define the type of manifestation

(referenda, public opinion surveys, focus group, among others) when the process opens; and define data viewing strategies for discussion and voting. See the Figure 6.

The Digital Library provide access to an information library with downloadable files in different formats (pdf, mp3, etc), register links by thematic and geographic category (see Figure 7). Already, the Socialization Space provide to citizens an environment for exchange of information, with a coffee-bar, a chat room and a message board (see Figure 8). See this wireframes below.



Fig. 4. Discussion by theme/demand



Fig. 5. Demands Voting

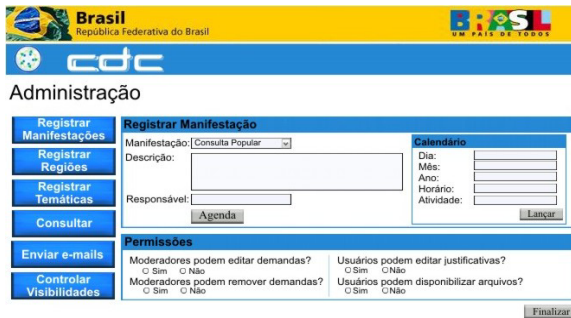


Fig. 6. Administrator View



Fig. 7. Digital Library



Fig. 8. Socialization Space

The DCC have also one help using it to clarify questions about the use of this environment, for topics and FAQ - Frequently Asked Questions.

e) Evaluation of the interfaces: the prototypes will be evaluated, considering the domain of government sites, following heuristic proposals in g-Quality Method [6] and sociability [18].

f) Case study DCC (Phase II): A later implementation of the DCC should include collegiate focus group in education as a case study to measure the decision-making. This system has already been introduced in Universidade Federal Fluminense (Rio de Janeiro - Brazil) and, potentially, in Universidade de Coimbra (Coimbra - Portugal). We believe that the transferability to other countries, with different cultural backgrounds, deserves deeper discussion.

g) Data analysis (Phase III): this step will be done after the case study, using the Degree of Maturity Method, allowing a wide range of data analysis (Phase IV), comparing applied research with biographical studies.

4 Conclusions

Previous researches show that we currently lack models and tools for integrating citizen input in e-Government process. By researching the existing relationship between televising techniques and virtual interaction strategies as well as the resulting participation of citizens in debate environments, we can conceive the Government-Citizen Interactive Model. The citizens are organized in a VC structured to that end. That way it is possible to promote e-Participation and e-Voting, the decision-making process being a reflection of consultations, voting and deliberations.

The main contributions of this research are to: enhance participatory access by the citizens in e-Democracy processes; provide an integrated means for consultation and voting, facilitating the exercise of citizenship by the citizens while securing transparency in the activities of governmental bodies; evaluate if maturity has been reached in the discussion of governmental issues as well as individual and collective responsibility in decision-making; develop a tool to measure the degree of maturity in active and responsible e-Participation regarding decision-making, and provide a model for the creation of discussion and deliberation environments on the Web, adaptable to other devices and applications.

Research studies on ongoing VCs also add value by considering issues, such as methods to inspect usability, accessibility and sociability; the role and power of the moderator in the decision-making, and the reputation of the citizen. The issues of trust and security in e-Democracy, data-protection and privacy are essential to e-Government applications and deserve to be investigated. Other serious challenges are posed in the search for e-Democracy, since the use of such systems by millions of citizens (e.g. in national discussions) highly increases the complexity of both DCC and DMM proposals; it can be misused by influential groups or by political activist; the existence of ill-intentioned hackers, invisible participants (lurking); and credibility should be ensured regarding the relevant information exchange among the participants.

The conception of a DCC for citizen interaction with governmental issues allows us to verify the effectiveness and continuation of an consultative and deliberative

process on the Web, allowing us to assess citizen behaviour in the decision-making process. In this manner we are developing a way to institutionalize interaction between citizens and governments. It is also possible to learn about the behavior of the citizen, who is identifiable within the virtual community and whose decision-making will be categorized according to the DMM.

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What Are the Future Possibilities of eDemocracy? A Discussion Paper

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Abstract. This paper presents some future possibilities for eDemocracy tools and considers how these new technologies might conflict with our basic assumptions about what democracy should be. I hope this paper will contribute to discussion of under what situations different forms of eDemocracy are appropriate. The possibilities and repercussions of user profiling, voting outside of polling booths, longer decision-making periods, changeable election results and weighted voted are considered. Although none are necessarily advisable, this paper suggests they might be interesting to consider.

Keywords: eDemocracy, e-participation, voting systems, user profiling.

1 Introduction — Definitions of Democracy and eDemocracy

Within this paper I use eDemocracy to refer to the use of information and communication technology tools to support democracy.

For this paper, I use Amartya Sen's definition of democracy when he says democracy is not only the need for "voting and respect for election results, but it also requires the protection of liberties and freedoms, respect for legal entitlements, and the guaranteeing of free discussion and uncensored distribution of news and fair comment" [1]. It is ideal that everyone has equal ability to access information, plan actions and be heard because democracy "can be deeply defective if [it occurs] without the different sides getting an adequate opportunity to present their respective cases, or without ... the freedom to obtain news and consider the views of competing protagonists" [1].

While this ideal is difficult or impossible to achieve, information and communication technologies may enable more democratic systems today than possible in the past. "More than 70% of the people in the world now live under conditions which are to a greater or lesser extent 'democratic.' This significant progress has created the foundation for the next major step: the democratization of democracy" [2]. Majorities of people in many democratic countries are positive to more citizen participation in politics [3]. Thus, this paper encourages you to creatively consider how technologies might be useful, or not useful, for deeper democracy.

It is important to note that the definition of democracy used in this paper is not limited governments. All sorts of organizations may find participatory and democratic

systems for decision-making useful in some circumstances. Please keep in mind that none of the ideas in this paper are necessarily suggestions for government elections, but just ideas for potentially democratic decision-making systems.

1.1 New eDemocracy Possibilities

The possibilities of eDemocracy are highly hindered by the lack of secure information technology. This problem is insurmountable for the near future and prevents any sort of internet system from being reliable and safe enough for voting [4].

Even without security issues, there is another important hindrance to eDemocracy—current constitutional and legal requirements. This means “an electronic voting ... system should respect and ensure ... General, Free, Equal, Secret, Direct and Democratic” standards in governmental elections [5].

However, in this paper I will imagine that neither legal nor technical hindrances apply to eDemocracy. In particular, I will consider if under some circumstances making democracy less free (from interference), less equal, less secret, less directly immediate and timely could also be democratic by improving “public discussion and exchange of information, views, and analyses” [1].

What is the use of considering a clearly hypothetical situation that ignores real technical and legal issues? For one, technical security problems may be solved (eventually) and in certain situations may be less important or more manageable¹. Legal voting requirements are potentially changeable, but more importantly they only apply to government elections. If we consider eDemocracy systems as systems not just used by governments during elections, but potentially used by other organizations² as well, then we have reason even today to consider different forms and under what circumstances and organizations different ones may be appropriate.

Table 1. Should we change our requirements for democracy?

E-voting requirements [5]	Possible alternatives
free (from interference)	→ deliberated and informed
equal	→ weighted
secret	→ recorded
direct and immediate	→ delayed
direct and timely	→ changeable

2 Secret or Recorded? – Too Many Decisions

Ideally, in a democratic society everyone should be able to participate in all decision-making. Unfortunately, it is obviously impossible for everyone to participate in all things. We will never have time in our lives to be involved in everything, but we should have the ability to participate in everything that matters to us. If something

¹ For instance, PCs in a corporate intranet that are only allowed to install certain software.

² For instance, as participation or decision-making systems potentially used by businesses, NGOs or even internally within government.

matters to us, we have important perspectives on what decisions should be made. But how can we manage all the things we might like to participate in?

It might be possible for anyone to participate in anything that concerns them with user profiling. User profiling can help you focus on what you care about, are involved in and are an expert at. This opens up a whole new level of democracy. It would not matter if there were a million decisions to be made every day, as long as the one you care about has your attention. This could enable a substantially different society than democratic ones today where citizens often only participate in decisions once every few years and generally only to decide who will be making the real decisions.

2.1 Definition of User Profiling

“A user profile is a (structured) data record, containing user-related information including identifiers, characteristics, abilities, needs and interests, preferences, traits and previous behavior in contexts that are relevant to predicting and influencing future behavior” [6]. In other words, a user profile is some information about you. It could be rather basic, like your name and age, or incredibly detailed, like a list of every item you’ve ever bought at the supermarket.

User profiles are used in many ways. A mundane use would be a small file stored on your computer that remembers your email login name and password. However, they can also be used in much more advanced ways. In “a retail organization, for example, user profiling would be a means to improve customer relationships, consequently sell more products and ultimately make more profit. For public organizations whose task is to enforce the law, user profiling is a means to increase citizens’ compliance to the law. Differences in the nature of organizations determine largely how user profiling might be used in various kinds of organizations” 6. Information about what people have done, tells you much about what they will do. Businesses mostly use this information to sell you things while governments use this information to control dangerous citizens. “It gives those organizations offering electronic services the possibility to gain insight into the behavior of individual users and influence them at the same time” [6].

Being monitored, analyzed and influenced makes people uncomfortable. A study in Australia found 91% want to be asked permission before companies use data for marketing, 89% want to know which persons and organizations have access to their data and 92% want to know how their data is used [6]. People are uncomfortable with the use of user profiling—this is why we have privacy laws to try to limit the scope of user profiling. “Like the private sector, the public sector makes more and more use of user profiling to personalize the electronic services that are being offered to citizens. User profiling offers great opportunities to make communication more effective and efficient, to infer and predict citizens’ behavior and to even influence behavior” [6]. As government use of user profiling grows, people will also grow more wary of government use.

2.2 Democratic Potential of User Profiling

Given the points made above, you may be wondering why I am claiming that user profiling has great potential for democracy. The ability of large (and powerful)

organizations to predict and influence the behavior of citizens is potentially very dangerous for democracy because of reductions in privacy and secrecy. However, might there be any democratic potential in user profiling?

Technology is only the enabler; we, as members of society, determine the way the technology is used. User profiling can be used to democratize society. In fact, it would be key to living in a radically democratized society where citizens make many decisions. Firstly, democratic user profiling would put the citizen in control of it. They would use it to “influence” themselves. In a radically democratic society, with many decisions to make, user profiling could allow you to find what you care about. Whether it is as simple as saving the fact that you are interested in “coal power;” or a much more advanced system where the computer helps match you to everything you might be interested in by comparing your voting, online and offline behaviors with others and then highlighting current proposals which are likely to be of interest to you, user profiling could make a deep democracy much more efficient and possible by bringing issues of concern to your attention so that you can participate in them.

In a democratic system, you would need to be in charge of your user profile to maintain an acceptable level of privacy. One study finds that “users expressed their strong desire to have full and explicit control of personal data and interaction. They want to be able to view and edit (update and maintain) their personal information at any time” [6]. People want to be and should be in control of access to, use of and management of their user profiles if it is to be used democratically. However, even if citizens are able to use and control user profiles for increased participation opportunities, there will still be reductions in secrecy and privacy.

Unfortunately, police and business user profiling usage is growing rapidly today—democratic uses are not. The danger is it will be used to entrench the power of the powerful. For instance, “after September 11, 2001, the American government was able to adopt the Patriot Act in only a few months. This led to highly advanced uses of data mining and user profiling of potential suspects of terrorism” [6]. This isn’t only an American phenomenon, “at present, all kinds of official citizen and business registrations are being standardized and linked in networks” [6]. When information about people is gathered and used by a few, democracy may become more problematic—but the key is how we decide to use it.

3 Free from Interference or Deliberated and Discussed?

Even if we retain the basic representative form of democracy, if voting starts to go on the internet elections will become less free from interference. Today, most people go, one by one, into private polling booths to make their electoral decisions. The intention is that, no one will be able to interfere with their political decisions if they make them personally and alone.

This has been of great importance to democracy, because people may threaten others into selecting certain leaders or parties. Especially if the elections are not secret, powerful people could punish those who did not vote for him or the way he wanted (or, more unusually, she wanted). Thus, it is vitally important that electoral decisions be personal, free from interference and secret if we are to prevent powerful people from limiting other’s political power.

But, is this necessarily ideal? The more politics is private and personal the more discussion and deliberation are limited. Many people argue that deliberation is of central importance to an effective democracy [7]. However, in much of the world the danger of political corruption is acute, and even in places where citizens have their rights and freedoms protected, as long as there are powerful individuals, the risk of repercussions are real—so the value of freedom from interference may outweigh the value of mutual deliberation.

Still, I want to suggest that depending on the kind of institution, and the social conditions surrounding the institution, deliberation and consensus may be more important than secrecy, personal decision-making and freedom from interference. In places outside government, like a workplace where you need to be held accountable for your decisions, secrecy may not be desirable.³ When making particularly volatile decisions (shall we promote religious law?), that are likely to invoke strong emotions, secrecy may be more important. For less volatile things, (should we build a new park?), deliberation may be more useful. In areas where democracy and human rights are still tentative, secrecy may be key.

3.1 Example from All Postal Elections

Many have voiced concern that both internet and postal elections face the same problem of keeping elections personal and free from interference [8]. In both cases, people do not vote in private booths, but instead vote in more public areas like homes, at work, or in community areas. Therefore, postal voting is “allowed only in some countries and also there only in exceptional cases” [8]. There is currently only one polity that requires all elections be done by mail—Oregon⁴.

Because voting is done over a period of several weeks, both electronic and postal voting increase the time one has to decide how to vote. People may use that time to discuss their ballots because they have time to consider them and may seek advice or share their opinions. In Oregon, everyone has information to base their discussions on in the voter pamphlet⁵ with contributed pro and against arguments that is sent to everyone. This allows voters to determine who is supporting or against a measure and why. Good information may lead to more discussion and better decision-making. In Oregon, some people and political groups have voting meetings where people discuss and decide how to vote on the measures.⁶ Because campaigns have changed into something that must keep active and maintain momentum during the entire voting

³ Even within governments decisions are not secret when people are to be held accountable for their decisions—for example, in most parliamentary votes.

⁴ Some Australian states do all-postal voting only for local elections and a number of places have done all-postal elections as experiments[9]. Oregon’s northern neighbor, Washington, is converting to all-postal voting on a county-by-county basis.

⁵ It is usually more of a book than a pamphlet. It contains each measure’s title, full text, a summary, an explanatory statement, estimation of financial impact, as well as arguments in favor and opposition that can be provided by any citizen or group.

⁶ There is a lack of study of how the introduction of all postal voting affects the kind of deliberation people do before an election. This is probably due to the difficulty in measuring something as qualitative as deliberation, but would be very interesting to investigate for those curious how internet voting might affect deliberation.

period [9], people may encourage each other to vote and become politically involved.⁷ Because of the active use of the initiative process in Oregon, there are more decisions to make [10]. More decisions require more time to consider. “Think about what it would have been like in a polling place if you had to wait in line while every voter had to work through 26 measures” (in addition to local city and county measures as well as voting for representatives) [11].

“Opponents have charged that the system is susceptible to fraud and that some voters may be coerced to vote a certain way. Despite allegations, no widespread voter fraud has been proven” [9]. The system in Oregon has been designed to be secure (primarily by requiring that the signature on every ballot be verified) and has functioned very safely [12]. So, there is nothing inherently insecure about postal voting, though jurisdictions that fail to design a secure system will face serious problems, an example being Great Britain [13].

More unsolvable, is the potential for coercion. Any election not held within the controlled environment of a polling place, such as postal, internet or ATM-style voting could mean someone is coerced to vote in a certain way. For example, one can imagine a family patriarch dictating how the household will vote. This potential for coercion is the negative side to more public politics—each institution and society will have to weigh this risk against the benefit of increased discussion. At least in Oregon, this danger has not become a major issue. In fact, a study of support for postal voting finds the greatest approval of the practice among groups presumably most likely to be at risk for coercion, such as women, homemakers, the disabled, retirees, the less educated, the youngest and the oldest citizens [14].

4 Direct and Immediate or Delayed?

If we imagine how democracy might work with e-tools, we might also wonder if elections need to be immediate and final. Today, with traditional paper ballot technology, a result must be announced and determined all at once. I have thus far suggested that there may be deliberative benefits to extending a voting period, such as with postal elections, but technology could make the voting process less immediate in another way.

In some circumstances, it might be useful to continually update voting results as they come in. Traditionally, this has caused problems. For example in the U.S., polling immediately after voting, and the fact that the western states are three hours earlier than the eastern states due to time zones, has lead some to worry that people may be voting in response to information about how the election is going. They may only go out and vote if they worry their candidate or measure is going to lose. This is an issue because it favors certain geographic areas that can get this information.

However, if everyone has this information, it is not so unfair. It can also help increase the efficiency and ease of the democratic process. For instance, if a measure is winning by 90% to 10%, there may be little reason to spend time voting on it. Also, this could allow a more active and responsive democracy, by encouraging citizens to

⁷ In fact, the information on who has and has not voted yet is updated each day and publicly available. Political groups use the information to contact and encourage people who have not yet voted to send in their ballots.

alert and communicate their political thoughts to each other on issues that may fail unless public support is attained. So, there might be some benefits to allow elections to last over a period such as weeks.

5 Direct and Timely or Changeable?

Have you ever made a mistake in an election, or voted for someone or something that you later learn more about and no longer approve of? In today's system, election results must be finalized. A re-vote is a huge (and expensive) undertaking, and requires everyone to vote again because votes are anonymous. It is only acceptable under extreme situations. But, if you have learned more and are better informed about an issue after voting on it, wouldn't it be ideal if the decision could reflect this new knowledge?

Electronic voting systems won't always need to make decisions as final as the current paper system. It might be possible to later change your mind about an issue, policy or representative and thus change your vote on it. This is another possibility technology could open up for democracy. While possibly inappropriate for democracy in certain organizations, those that need to respond and change rapidly (like businesses) might find a more responsive and flexible decision-making system useful.

6 Equal or Weighted Voting?

The claim: One citizen, one vote may not always be the most democratic system.

6.1 Current Exceptions to Equal Voting

While one citizen/one vote is likely the dominant paradigm of democracy, there are already many areas where we do not use it. An example might be, during shareholder meetings where voting weight is determined by the number of shares you own. The idea is that those who are more affected by the decision should be given more decision-making weight.

You also sometimes see this in government as well. Some governments require certain percentages or numbers of minority groups in their legislatures. For example, New Zealand reserves some legislative seats for the native Māori people and about 100 countries have or are considering some form of quotas for female legislators [15]. The intent is to protect the rights disempowered people.

There is a danger that a government will only respond to the needs of a dominant group. This danger has been a continuous problem throughout history. It is worth noting that authoritarian governments have a long history of repression of minorities, and representative democracies do as well. However, governments that are democratic are much better than more authoritarian ones at respecting their minorities [16], but this will continue to be a danger in future democracies as well.

6.2 Unequal Voting May Be 'Fair'

There may be ways of lessening this danger with technology. Consider these three statements:

1. Decision-making authority should be based on a relative level of involvement in the decision.
2. Decision-making should be based on a relative level of effect from the decision.
3. Decision-making should take into account a relative amount of experience with and expertise on the topic.

If you view democracy as more than just the ability to determine what a majority wants, but as something that should respond to everyone's needs and respect everyone's rights equally, then these statements may be compatible with democracy in at least some situations.

Today, when democratic decision-making does not follow the one person/one vote paradigm it is often in informal contexts that do not involve a vote. It is less common for votes to be formally weighted differently. Part of the reason for this is, historically, there would have been no fair way to do this. A stockholder's meeting is an interesting exception; at the meeting, it is exactly clear how heavily each investor is (financially) involved in the organization. So this information is used to ensure that those who are more heavily involved have a stronger vote. This might work for a business whose sole purpose is to earn its shareholders money, but how can we determine a fair way to weight votes for other decisions?

6.3 User Profiling and Unequal Voting

Earlier, I argued that user profiling has great potential to make democracy possible on a deeper level by ensuring that the decisions and issues we care about are easily accessible to us. User profiling has another interesting potential use for democracy—we could use it to make sure that democracy fairly accounts for your involvement in the issue, effects from it, and expertise with it.

User profiling could be used to determine individuals' voting power on an issue. This is a bit odd, scary and probably ill advised—but the purpose of this paper is to discuss some alternative eDemocracy possibilities so let's consider how it might work.

A user profiling system might analyze which things you vote on and see who else also votes on them. If it sees many of this same group voting again on another issue, it would assume that you were part of a group that was involved, affected and experienced with it and then more heavily weight your vote on that issue. It might also take into consideration other participation such as writing, commenting, reading, etc. It would have to marginally decrease your vote weight on all other issues to remain fair. Presumably, there would be limits to how much your vote weighting you could gain or lose—your vote would have to still matter even when voting on something you are less experienced with or passionate about.

6.4 Hypothetical Example of Unequal Voting

For example, let's say I live on Blue Street. The other Blue Street residents and I often vote on things that affect Blue Street, such as repaving the sidewalks or building a school on it. So the system's algorithms have tagged us as a group. When the system sees most of this group participating on something, it assumes it is a proposal

which strongly affects this group (it's probably something happening on Blue Street) and so gives this group, the Blue Street residents, a little more authority on the issue.

Let's say a planning proposal comes up. Some people want to build a nuclear dump, and there is a proposal to build it on Blue Street. Everyone who lives on Blue Street votes no on the proposal because it will affect them so strongly. The system sees that this must be an issue affecting, involving or using the expertise of these Blue Street people, and so it gives them higher voting weight. Let's say two votes a person. Unfortunately, some of the people who live on Yellow, Purple, Green, Brown and Red streets vote yes on this proposal because it sounds harmless to them. It didn't result in a large number of any group of these people voting on the issue because no group of them was highly motivated by it, so the system assumes they are relatively disinterested voters, and maybe they only get .5 votes each. Imagine 25% of the votes were Blue Street people voting no, and 75% were random other people voting yes. In a typical democracy, all the Blue Street people would then die of nuclear radiation. However, given this weighted voting system, the Blue Street voters would have won with 50% to 37.5% weighted voting points.

7 Concluding Discussion

“Our future society will to a great extent be based on functions of IT. This society is not ‘coming’. We are building it. Democracy is not ‘happening’. If we want democratic procedures to be an integrated part of our society, we must design them” [17].

These proposals are intended to stimulate discussion. It would be highly inappropriate and generally illegal for a government system to implement any eDemocracy that weights votes differently, removes anonymity from votes so that they could be later changed by the voter, extends voting periods, does away with private polling booths or creates user profiles to connect citizens with policy decisions they are interested in—at least until these ideas were experimented with and the repercussions and appropriateness of different systems were agreed upon.

However, these or other forms of democratic decision-making may be of interest to other types of organizations today. For example, weighted voting systems might be able to ensure that those with experience or expertise with a given issue had a stronger voice in the decision. For example, in a business, you would want your advertising department to be mostly in charge of the publicity campaigns for your products. The decision-making system would put together that these advertisers are participating in many decisions related to advertising, so would weight highly their input when they are participating as a group on an issue. While some other people might also have some input on various decisions, they would be relatively lightly weighted—unless it was an issue that motivated another section of the business to also participate in mass. They would then also have higher weights on that business decision. The organization could ensure various specialists were key decision-makers in their fields of expertise while allowing anyone with useful feedback to participate in the decision, so there would be wider use of the organization's knowledge at the same time. This could be both an appealing and democratic way of managing institutions.

I hope this paper has encouraged you to consider some possible democratic uses of technology and imagine even more yourself. Some of these possibilities may be inappropriate for democracy in certain situations, but we can't even begin to determine what forms of eDemocracy are appropriate until we consider what things technology makes possible. Especially if we open ourselves to the possibility for democracy within a variety of institutions, such as governments, businesses or non-governmental organizations, we may open ourselves to even more creative ways to deepen participation within our societies.

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The Development of the Local E-Administration: Empirical Evidences from the French Case

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Abstract. The local dimension of e-Administration is not usually well developed in the literature. This paper contributes to the knowledge on the various issues raised by local e-Administration and proposes an analytical framework for the evaluation of the potential local online service offerings. Examination of how local public administration has developed in France is based on evidence from a dedicated survey of a sample of French communes. The analysis will enable us to identify the relative effort and performance in the development of local e-Administration based on the particular socio-economic characteristics of the communes. The analysis benefits from information derived from a survey designed particularly to address the issues raised in this paper.

Keywords: Communes, e-Administration, Public Services Online, Performances, Stage models.

1 Introduction

This paper addresses the development of e-Administration services implemented by the French communes¹ and focuses on how the local context influences these online offerings. These influences are numerous and differ across communes at both residential and economic levels. The aim is to trace the development of e-Administration in France, and highlight the factors that have influenced its evolution. This is in line with one of the least well-known aspects of the Lisbon strategy, which paradoxically is also one of the most important.

National level e-Administration efforts are generally well measured and documented ([7]; [28]; national reports and studies, etc.). However, the evolution of e-Administration is occurring at a number of levels, and particularly the local level. The implementation of local online administration services, i.e. implementation by communes of innovative online services for users (households, firms, associations ...) in order to complement the national online offering, become more and more important. Local e-Administration is key to the transformations that are being induced by increased application and use of information and communication technologies (ICT). However, in depth analyses of business services, national public administration services and services offered by communes are rather scarce [11]. Communes are fast

¹ The commune is the basic entity in the French territorial division.

becoming key players in innovative developments and are at the locus of wealth creation. The importance of the local and regional levels has increased with globalisation and greater international competition [26]. Communes are becoming involved in these globalisation and competition processes in terms of providing attractive alternative for locations for firms and residents. They need to satisfy the requirements of local actors and increase their attractiveness through specific online service offerings. The need for communes to improve their positions in the international competition has been promoted by national policies and the European Union's Lisbon Strategy aiming at the building of a competitive Information Society.

ICT, and especially the development of the e-Administration, are key factors in these national and European policies. ICT facilitate and enhance traditional economic processes by reducing transaction costs and enabling practices and techniques to be shared over a global communication network [14].

This paper proposes to add to the knowledge base on the different issues raised by local administration (Section 2). It provides information on the evolution of online service offerings and builds an analytical framework. The French communes are often free to choose the nature and level of services they will implement, ranging from simple information on the services available, to online provision. With the exception of certain services which involve legalities (e.g. public tenders), the provision of local administrative services is at the discretion of the communes in France. Section 3 traces the development of e-Administration in the French communes. Section 4 discusses the development of local e-Administration relative to the communes' socio-economics characteristics. The analysis is based on information derived from a survey designed to elicit information on the provision of e-Administration, administered to a sample of French communes.

2 E-Administration at the Local Level

2.1 Measuring E-Administration Development at the National Level

The study of e-Administration development at local level is a complex process. The level of development of e-services indicates how far the various communes have moved towards full electronic operation online.

Several methodologies have been applied to evaluating e-Administration. Stage models are often used to address the evolution of the e-Administration development. Green [15] suggests three stages: attracting (using the website), transforming, and utilization of media technology. Fink et al. (quoted in [30]) propose the stages of attracting, enhancing and retaining client relationships using web site applications. These models consist of a first step towards a fully fledged evaluation. Most of the following adopt the European Union four stage model defined in [7] and [13] ([10],[19],[30],[32],[35]). In stage one, the information phase, the government creates a website with online information about the procedure and services. There is no integration between the front and back office processes [30]. In stage two, which is a one-way communication phase, the public website provides forms that can be downloaded. In stage three, the two-way communication phase, users are able to transact with the communes on-line by filling in forms, to which communes respond

by providing confirmations, receipts, etc. In stage four, the transaction phase, there is a vertical integration. The service is completely processed online, including decision, delivery and payment where necessary. The processes are all automated and digitized.

The above models do not take account of the implications of the introduction of ICT on the internal business processes. The methodologies developed by Lee [23] overcome this limitation. Lee [23] proposes a five stage model: attracting, informing, creating a community (online forum, events, e-Magazine domain identity and community services), delivery (presence or absence of features), and innovation (transformation of existing services and introduction of new innovative services).

These studies do not take account of the users' perceptions of the offerings. [27] propose a more technical stage model, which although it does not indicate users' perceptions of the website, it allows some measurement of the effort required to design a service that is good for users. It evaluates the quality of a commune website and its services, in five phases. The first phase refers to the website's *interface*. Phase two evaluates the ease of *navigation* of the website. Phase three evaluates its *content*, phase four measures the site's *reliability*, and phase five evaluates its *technical* attributes. Peters *et al.* [30] argue that some of these criteria seem to have been inspired by the author's interest in e-Commerce practices, but many are also applicable to e-Government.

2.2 Measuring E-Administration Development at the Local Level

The aim of this section is to measure the development of e-Administration at the local level. Our study is not exhaustive and does not evaluate user satisfaction of e-Administration services. However, we hope to mitigate the lack of information on the efforts of French communes to improve public services using ICT. We generally implement the European indicator model at local level; however, we do ignore the impact of innovative services on the internal business processes of the commune and the evaluation of users' perceptions. Factors related to users are considered in the analysis in Section 4.2. Here, we address the state of deployment of the e-Administration services at local level.

The first question relates to which services are provided. A nomenclature of services has been built that includes two aspects [3]. The first relates to the beneficiary of the service. This includes information technology infrastructure, back office public administration (Government to Government, G2G), and government to users (Government to Business, G2B; and Government to Customer, G2C). The second one is an adaptation of the categorisation developed by Cap Gemini (2005) which reflects a distribution of effort according to the commune's internal processes. The final nomenclature breaks down the most common offerings in e-Administration services: box office services (tickets for concerts, museums, etc.); registration services relating to town planning, public contracts; authorisation for roadworks, building licensing, information from and communication with elected representatives (forums, chats, commune job openings, etc.).

The availability of broadband networks is a necessary condition for the development of e-Administration. Broadband offerings are evaluated using two indicators identified in [3]. The first measures the type of offer: (i) private telecommunication operator initiatives; (ii) from a private operator in response to

pressure from the commune; (iii) from the commune itself. The second indicator measures whether the communes use broadband networks via Internet or/and Intranet.

In Section 3, the stage model is applied to the French communes. The descriptive results will indicate how the variables can be introduced relative to users.

3 State of Development of E-Administration in French Communes: A Descriptive Analysis

A survey of 95 communes with more than 10,000 inhabitants was conducted in early 2006, on the basis of the stage model described in the above. The survey is representative since the communes were selected according two criteria: a geographical and national repartition of the communes and a distribution of the commune by layer of population. The survey was addressed online (by mail) or by phone to the director of informatics systems (DSI in French) of the communes. The survey has been built from a questionnaire which asked about the e-Administration services available on their commune websites. It asked the interviewed DSI if the e-Administration services identified in paragraph 2.2 are developed by their commune and about the stage of development of each exiting services.

The survey shows that the level of development of local e-Administration services is disappointing. The services identified in phases described in Section 2 have not been implemented by all the communes. Among those that are available, only a few have reached a well developed stage. 90% of the communes surveyed have less than 50.000 inhabitants. Therefore, it can be said that for small communes the development of e-Administration is immature. The communes in our survey fall into two categories: (i) those that have not developed local e-Administration services; and (ii) those that have introduced some simple services.

Figure 1² depicts three stages in: building licensing services, authorization to undertake public roadwork's, box office services; town planning; building licensing; and commune job situations vacant. None commune developed services relate to the two-way communication phase and transaction phase. It can be seen that 51, 8% of the communes surveyed are not offering online services related to building licensing and 48, 2% have developed only the first two levels of online offering (information phase and one-way communication phase). Only three services and in only a few communes have developed to the transaction phase (registrations, public contracts citizen consultation).

Regarding broadband, in 4 of the 95 communes there were no private offerings; thus we removed them from the analysis. 20% of the communes had set up their own broadband network to mitigate the lack of private initiatives and 20% had put pressure on private operators to offer broadband services. The remaining communes had access to broadband as a result of spontaneous initiatives of private operators. Thus, the communes fall into two broad groups: either the commune is ensuring that there is access to broadband in its territory, or private operators are investing in the market.

² Authors' calculations of a survey in 95 French Communes with >10.000 inhabitants, 2006.

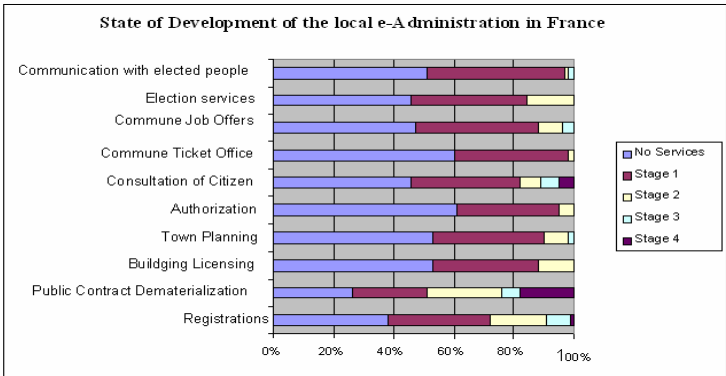


Fig. 1. Frequency and Evolution of local e-Administration services in France

To sum up, innovative services are not being offered by all the communes in our survey. The communes that are investing most in the development of e-Administration are mainly the larger ones, with more than 50,000 inhabitants. Services that are in an advanced stage of development are rare. The majority of the services that exist are still at the second stage of maturity. There appear to be two main tendencies: (i) the commune has not developed services, or (ii) the commune offers very basic services (information or/and one-way communication phases). We can assume that local e-Administration has not taken off in the French communes for two reasons. First, the effort required by some communes to deploy digital networks in their territories is huge and is consuming a huge share of their budgets; secondly, digital network development in the communes is at an early stage (equipment in computers, recruitment and training of employees, etc.) and the full e-Administration services development phase has yet to be achieved.

4 Definition of the Econometrical Model

The initial aim of the survey to identify the effort of communes in developing e-Administration is complemented by the construction of socio-economic variables. This study develops an innovative two step methodology; the first step involves construction of the variable *e-Administration*. It divides the communes into two subsets based on their efforts to improve their administration services. The classification is based on a statistical analysis of the survey. The second step explains the variable *e-Administration* based on the socio-economic characteristics of the communes. Four groups of explanatory variables were built to complement the survey (economic, education, socio-professional categories and geographic variables). Finally, we analyse the relationships between the likelihood of a commune developing e-Administration and its socio-economic characteristics using an econometrical model.

4.1 Building and Modelling the E-Administration Variable

4.1.1 Definition of the Classes

The communes are divided into two classes according to e-Administration development, using a hierarchical classification methodology. Table 1³ presents the percentage of communes that have developed advanced local e-Administration services, for each class. Class 2 seems to be generally more advanced than Class 1 with a higher percentage of communes offering town planning, building licensing, authorization to undertake road works and registration services. For example, 34 communes from class 2 have introduced advanced town planning services against only 7 communes in class 1. 15 communes from class 2 have made efforts to introduce a broadband infrastructure in their territories against only 2 communes in class 1. However, in terms of Intranet services and number of computers in public places class 1 scores slightly better than class 2 with 17 communes with advanced intranet services against 16 in class 2.

Table 1. Developed *local e-Administration services* in each class

Services	Class 1:		Class 2:	
	effective	%	effective	%
Registration services relating to town planning	7	20,0	34	77,3
Box office services (ticket for concerts, museums ...)	11	31,4	20	45,5
Building Licensing	3	8,6	37	84,1
Election services	17	48,6	28	63,6
Broadband offer	2	5,7	15	34,1
Consultation of Citizen	2	5,7	12	27,3
Communication with elected representatives	13	37,1	27	61,4
Authorization for road-works	8	22,9	25	56,8
Interactive public access terminals	15	42,9	28	63,6
Commune job openings	18	51,4	24	54,5
Registration Services	9	25,7	17	38,6
Public Contracts	16	45,7	25	56,8

4.1.2 Modelling E-Administration Variable

The model aims to explain the determinants of the two classes of communes related to the development of local e-Administration services. A logit model is built to explain the e-Administration variable defined in the earlier sections. This variable y takes the following form: $y = 1$ if the commune is oriented towards the development of e-Administration services, and $y = 0$ if it is not.

4.2 Identification of the Explanatory Variables

Selection of the explanatory variables is based on a review of the literature relating to the deployment of the ICT and the diffusion of ICT services in the communes. This

³ Authors' calculations of a survey in 95 French Communes with >10.000 inhabitants, 2006.

includes the literature analysing externalities and the unequal deployment of broadband (the digital divide). The infrastructure divide can be explained by analysis of the concentration of activities in terms of externalities. The social divide can be explained and measured based on the socio-economic characteristics of households. Three sets of variables emerge from these literatures.

4.2.1 Geographic Variables

The «*death of distance*» [6] was seen as a possible consequence of the development of the ICT. However, it quickly became clear that in fact ICTs were inducing a quite different effect and that recognizable infrastructures divide had developed and was increasing, which has become the subject of much debate on inequalities. The separate control of two forms of competition contributed to reinforcing the variations in broadband development between territories [1]. These two forms are the competition over broadband offerings among private operators [29], which was stimulated by the liberalisation of the telecommunications sector; and territorial competition in terms of attracting productive investment, which has been reinforced by public decentralization [33]. To try to overcome these problems, the nations of the European Union established a geographical policy for broadband cover.⁴ This public initiative⁵ had the effect of (i) increasing the competition between local authorities and the telecommunication operators; (ii) inducing the emergence of a new form of competition that between the private and public sectors [2].

The influence of the physical variables related to public and private investment in ICT increased and evolved. Thus, in our analysis, we define a geographic variable in order to test its influence on e-Administration development at the local level.

4.2.2 Economic Variables

In addition to geographic considerations, spontaneous investments from private operators were influenced by the economic concentration of activity in the territory. This is represented in the analysis as a MAR (Marshall-Arrow-Romer) and Jacobs externality. MAR and Jacobs consider growth of the local industrial complex as an externality [8]. The MAR approach predicts that industries must specialize geographically and that specialized local industrial complexes will grow more quickly based on increased spillovers of knowledge. The Jacobs approach predicts that the best growth performance occurs in the most diversified industrial complexes. Both theories agree about spillovers of knowledge, but diverge about the fundamental sources of these externalities, whether they are inter or intra sectoral. Empirical checking of these theories has produced an important literature, largely punctuated by the work of Glaeser and Henderson.

A number of studies based on employment data show that there is stability in US industry ([9],[12],[17]) despite some major changes in wages and demand ([16],[17]).

⁴ E.g.: “*Law for Confidence in the Digital Economy*” in France; Italian Information Society Program since 1997-1999 (Direttiva del P.C.M. «*Micheli*» (3 mars 1999), Legge delega 443/2001 «*Lunardi*», Legge 166/2002 (art. 40-41) «*Collegato infrastrutture*», Decreto Legislativo 198/2002 «*Gasparri*»); German law on Multimedia Informations- und Kommunikationsdienste (KDG); British e-commerce@its.best.uk program, etc.

⁵ For a review see Attour-Oueslati et Christian Longhi, 2006, Services, usages de l'Internet, et développement économique, PUCA 767.

This stability is in line with Krugman's [22] argument where he talks about "first nature - second nature" advantages using the example of Chicago. Chicago's first nature geographical advantage, river transport, was quickly erased with the arrival of rail transport, which overcame disadvantages related to climate and location. However, Chicago's second nature advantages, population and production concentration and good city transport nodes, reinforced its position as a leader.

Thus, the influence of geographical and economic variables must not be overlooked. These variables take account of the economic landscapes of the communes and test the influence of concentration of production in developing innovative services for public administrations.

4.2.3 Socio-Economic Variables

In their analysis of Internet adoption and use by French households, Le Guel *et al.* [24] built an econometric model. Their study highlights the importance of household members' socio-economic factors (age, level of study, socio-professional characteristics). This study is part of a very rich literature which includes studies by Allegrezza and di Maria (2003, quoted in Le Guel and Pénard, [24]) who highlighted a digital divide in Internet use between retired people and members of the working population. Le Guel *et al.* [24] stress that many studies ([18],[20],[31]) have shown that first adopters of the Internet are relatively young (34 years old on average), are male, are fairly highly educated, receive higher than average incomes and are attracted to technologies.

The technological, organisational and institutional changes induced by e-Administration are socio-economic processes that are mainly driven by users. The services offered by the communes are aimed at citizens and companies. We supplemented the information from the survey with some information on socio-economic characteristics of the population. We include variables for: residents' average income, total number of working people, share of retired population, share of graduates in the population and share of citizens without higher education, education levels in the communes, and socio-professional category.

4.2.4 Definition of the Explanatory Variables

We built a socio-economic database which includes economic, socio-economic and geographic variables for the 95 communes in the survey.

The descriptive analyse of the economic environment of the communes considered in the survey allow us to compare the global economic environments of these communes: communes with advanced local e-Administration service development and the communes that are developing innovative services. The concentration of activities is more important in those communes involved in developing local e-Administration. The level of services to business companies (18.41%) and services that are socio-education oriented (15%) in the communes with advanced local e-Administration is higher than the levels in the second class communes (respectively, 14.38% and 12.43%) and also higher than the levels in all communes (respectively, 16.62% and 13.89%). The tendencies for transport business, number of schools in the commune, share of working people, average incomes, density of population and level of education are similar. However services to industrial (9.81%) and commercial users (30.34%) are higher for communes just starting development of local e-Administration (8.9% and 27.3%).

5 Results of the Econometric Model

The assumptions made previously concerning the influence of the economic, socio-economical and geographical variables on the development of the e-Administration services in communes are tested in the following logit model (see also Table 2):

e-Administration = $f(\text{Share of Industrial Business, Share of Commercial Business, Share of Transport Business, Share of B2B Business, Share of B2C Business, B2E Business, Schools, Average Income, Density, Share of Managers, Share of Independent Workers, Share of Employees, working population Rate, Share of Higher educated Students}) + \text{const} + e_i$

The results of the logit model show an unequal development of e-Administration services in the French communes. Different tendencies can be identified thereby.

The economic characteristics of the commune significantly influence the development of e-Administration. The probability of local e-Administration services developing increases with the greater localisation of industrial, commercial, B2B Business, B2E Business. These results confirm geographic and economics studies, which show that ICT investments are strongly concentrated in agglomerated zones ([4],[5],[21] etc.). The efforts of communes are stimulated by the intensification of local or regional activities [34]. The rate of services to private businesses does not have an effect on the development of e-Administration. The communes with business service oriented economies are more implicated in the development of e-Administration. The economic landscape of the commune is an extremely important factor in the decision to implement e-Administration. In line with Jacobs, the most diversified industrial complexes show the most important growth.

The professional qualifications of the population have a significant influence. The parameters estimated for each socio-professional category do not have an equal influence on the efforts of the communes. The professional categories of manager and craftsman do not significantly increase the likelihood that the commune will develop local e-Administration services. However, the positive and significant influence of employees shows that the proportion of working population in the commune has a positive influence. The type of local e-Administration services offered by communes diverges according to their predominant class. Thus the average income of inhabitants significantly influences the strategic orientation of the communes. The local e-Administration services offered can be a function of the purchasing power of the commune's population, i.e. it is not the occupation but the average income of citizens that influences the offering.

The number of higher educated members of the population does not influence the development of the e-Administration in the communes probably because universities and high schools are often localised in agglomerated communes. Analysis of the signs for number of schools in the territory positively influences the commune's orientation towards development of e-Administration. Finally, the model shows that the commune's physical characteristics have only a small impact on its local e-Administration orientation strategy.

Table 2. The Logit model

Log likelihood = - 40.030791		Number of obs = 79		
		LR CHI 2 (7) = 28.43		
		Prob > chi2 = 0.0125		
		Pseudo R2 = 0.2620		
e-Administration		Coef.	95% Conf. Interval	
Economic Variables	Share of Industrial Business	0.3546736*	0.0167322	0.69615
	Share of Commercial Business	0.1929476*	-0.0156495	0.4015447
	Share of Transport Business	0.3121765	-0.1452326	0.7695857
	Share of B to B Business	0.3750959**	0.07276	0.6774318
	Share of B to C Business	0.0047831	-0.2672426	0.2768088
	Share of Socio-Educational B.	0.4120129**	0.1432026	0.6808232
	Active Rate	-0.1717448	-0.4217128	0.0782231
Socio-Economical Variables	Share of Managers	-0.2060908	-0.6479253	0.2357437
	Share of Independent Workers	-0.0504985	-0.3382778	0.2372809
	Share of Employees	0.1893606*	-0.31354	0.4100753
	Schools	0.291333*	-0.7855303	1.368196
	Share of High Degree Students	0.083554	-0.4985357	0.6656436
Geographic Variable	Density	0.4658283	-0.2588623	1.190519
Constante		-79.31158*	-150.6832	-7.939933

6 Conclusion

This paper highlights two main points: 1) implementation of local e-Administration by the communes considered in our survey is at an early stage. Among the communes which are offering e-Administration services, only a small number has reached a high level of maturity. The services being offered in communes with less than 50.000 inhabitants are in their infancy. 2) The strategic orientation of the small communes is strongly related to the characteristics that define the social divide.

Two groups were highlighted to explain the efforts of communes regarding online local services, one that has developed some e-Administration services and one that has been fairly inactive. This classification allowed us to build a variable "e-Administration". We modelled it in order to study the relations between the geographic, economic and socio-economic characteristics of the population, and the maturity of online services.

The econometric results of the logit model show clear tendencies. There is an effect from the localisation of schools. The economy of the territory has an important influence. Communes with a business service economy (public or private business) are more active and even proactive in setting up local e-Administration services. In

contrast, communes with B2C business are relatively inactive in this direction. The development of the e-Administration is also sensitive to the purchasing power of its citizens. The physical characteristics of the communes did not have an effect.

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What Matters in the Development of the E-Government in the EU?

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Abstract. In this paper we presented an empirical insight into interdependences between selected national performance indicators and e-government indicators at national level in the European Union. Results show that the level of economic development has a moderate impact on the e-government development, while national competitiveness and innovation play quite a strong role. There is also a low correlation between overall government efficiency and e-government. It confirms that e-government projects are predominantly politically and not economic or socially driven. However, the most economically advanced Nordic countries and UK have all very high e-government readiness. On the other hand, there is surprisingly low correlation between e-government usage by enterprises and individuals, which indicates very different incentives for business and the public. The relatively low performance of new EU member states was also noted.

Keywords: eGovernment policies, Cross-national comparative studies, Societal aspects of eGovernment, The role of eGovernment in development, European Union.

1 Introduction

Political and public interest in e-government has significantly increased since the European Commission introduced indicators to monitor the eEurope action plan, including e-government development [16]. It has even triggered an interesting political competition between individual countries. Consequently, in many EU countries e-governments became distinctly politically driven projects which were guided by 'national' strategies and 'national action plans'. Countries that were lagging behind carefully studied and even copied best practice from more advanced EU member states. This practice has been seen particularly in Central Europe. They imitated technological and organizational solutions from more advanced countries, but too often the results were far below their expectations. It is obvious that the policymakers underestimated or overlooked many of the driving forces as well as barriers to e-government development [3].

The latest studies and accumulated experience with e-government projects have revealed many social and other non-technological issues behind e-government development [4][13]. It motivated a scientific community to study e-government phenomena from different perspectives; focusing on driving forces and key success

factors [1]. For example, economically advanced countries are not always the best in e-government development. Many new EU members like Estonia or Slovenia are doing better than may be expected from their economic power.

To date studies have predominantly been driven by ‘measuring and benchmarking’ approaches, concentrating primarily on the supply side of e-government. There are abundant references on the key success factors at the micro or project level, dealing primarily with the methodological and technological issues of e-government projects [5][12]. However, fewer studies have been conducted at the macro or national levels, putting the success factors into the broader socio-economic environments of an individual country [7][10][11]. One can argue that there is still insufficient understanding of relevant incentives for e-government development at the national level. Better understanding of the most important “national” driving forces is needed, answering questions such as: “Is it a political initiative, technological push, or simply a stimulating national environment that one can presume to be present in the most economically developed countries?”

Noris [8] and later Wei [17] worked on a conceptual framework that would facilitate an understanding of better e-government environments that can influence the progress in individual countries. He presented a three level e-government engagement model followed by the key variables which are influencing e-government environment. According to this model, e-government environment measurement consists of the three key variables: web presence, ICT infrastructure, and human capital. Interestingly, GDP and other economic indicators were not in the first plan.

From the perspective of our research, Singh *et. al.* [14] produced an even more interesting approach, which focused on the correlation between national-level determinants and e-government maturity. In the research the authors started with hypothesis that GDP plays a decisive role in the development of e-government maturity in individual countries. E-government maturity was defined according to the West [18] definition and the data was taken from the same source. At first glance, one would argue that there should be a strong correlation between GDP and e-government readiness or maturity since the most developed countries are also on the top by e-government ranking [20]. Singh also assumed that GDP plays a role through three distinctive influences: technological infrastructure, human capital and governance index; which are all strongly dependent on national GDP.

The research presented in this paper was similar in terms of research interests to Singh [14], however this model and trial area was pointedly different. It focuses on interdependence between e-government indicators and the most relevant economic performance indicators at national level in the European Union. The authors tried to evaluate the influence and interdependence of these factors with the aim of discovering ‘hidden links’ that might prove very useful in e-government policymaking in the future.

2 Research Approach

The trial area for our research was the enlarged European Union with 25 member states (EU25). The goal was to find any interdependence between general national performance indicators and e-government indicators. Fig. 1 shows seven commonly

used measurements for national economic performance that are supposed to influence e-government readiness. GDP per capita was placed on the same level as other economic driving forces. On the other hand, e-government readiness affects e-government usage by individuals and enterprises, as well as e-participation and on-line sophistication. This research model also envisaged an interrelation between e-government usage by individuals and enterprises.

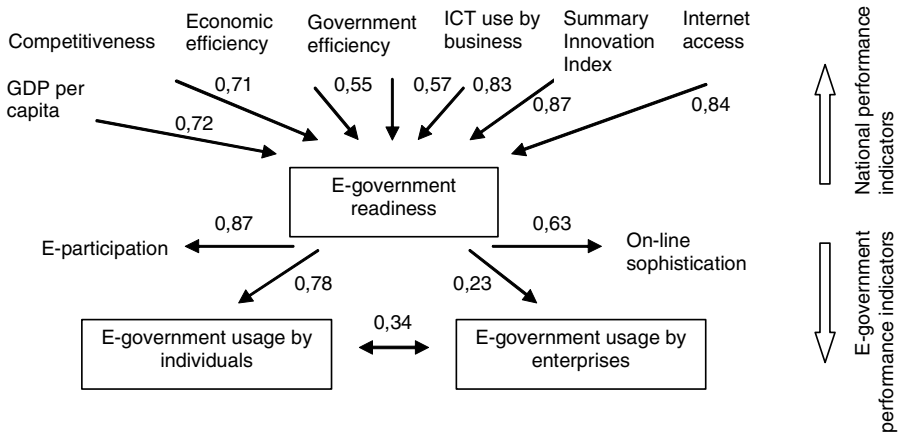


Fig. 1. Research model showing e-government drivers and outcomes with belonging correlations

Three hypotheses were defined to reflect the common perception of incentives in the national environment for e-government development. They seem trivial, but the research demonstrated that sometimes perceptions of the relevance of these interdependences are quite distorted.

Hypothesis 1. There is a strong positive correlation between the level of the national economic power expressed in GDP per capita and e-government development. It was simply presumed that e-government was more advanced in economically more developed and efficient countries, and vice versa.

Hypothesis 2. Overall socio-economic readiness plays a positive role in e-government development. A positive public atmosphere and innovation orientation and new technologies can be presumed to stimulate politicians and governments to initiate projects and it also stimulate businesses and individuals to use of e-government services.

Hypothesis 3. General government efficiency is positively correlated with the level of e-government development. It means that already developed and efficient governments are supposed to introduce e-government projects faster and more efficiently.

The research was conducted on publicly available secondary data from different international information sources as follows: Competitiveness, Economic Efficiency, and Government Efficiency [21], Summary Innovation Index [19], E-government

Readiness and E-Participation [20], On-Line Sophistication [16], E-Readiness [9], GDP per capita, E-Government Usage by Enterprises and Individuals, Spending on Human Resources, and Internet Access Summary Innovation Index. In some cases, full sets of indicators were not available for all 25 EU countries. In these cases correlations were calculated on smaller sets, but not below 21 countries.

3 Presentation of Results

Table 1 indicates the correlation coefficients for all datasets explored in the research. It provides an overview of interdependences between national performances and e-government indicators. All correlations that are significant at the 0.05 level are marked with an asterisk and correlations that are higher than 0.70 are marked in bold.

3.1 The Role of GDP and Economic Efficiency

A brief look at the first row in the Table 1 reveals that economic power (GDP per capita in PPP) has a very moderate impact on the current state of e-governments. Only the correlation with e-government readiness (a composite index comprising the Web measure index, the Telecommunication Infrastructure index and the Human Capital index) is higher than 0.70 (Fig 2), all other correlations fall within the 0.32 to 0.61 interval. The different findings of Singh *et. al.* [14] are likely to be based on significantly different sample. They discussed a world wide sample of countries while this research was restricted to EU countries.

Table 1. Correlations coefficients for selected national performance and e-government indicators for EU25 member states (* Correlation is significant at the 0.05 level.)

	E-government readiness	E-government usage by enterprises	E-government usage by individuals	On-line sophistication	E-participation
GDP per capita in PPP	0.72*	0.32	0.61 *	0.56 *	0.47 *
Economic efficiency	0.55 *	-0.28	0.41	0.66 *	0.49 *
Competitiveness	0.71 *	0.26	0.82 *	0.39	0.47 *
Summary Innovation Index	0.87 *	0.30	0.80 *	0.52 *	0.62 *
E-readiness - ICT use by business	0.83 *	0.23	0.64 *	0.59 *	0.66 *
Internet access	0.84 *	0.20	0.87 *	0.45 *	0.67 *
Government efficiency	0.57 *	0.29	0.69 *	0.66 *	0.41

Table 1 indicates that e-government usage by enterprises, on-line sophistication, and e-participation all have low or even no correlations with national performance indicators. There is no prevailing performance indicator with a correlation higher than 0.7. This could indicate two things; there are other relevant development forces at

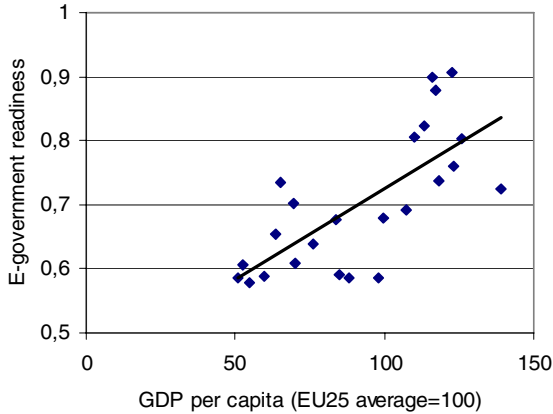


Fig. 2. Correlation ($R=0,72$) between e-government readiness and GDP per capita in PPP (sample of EU 24 countries)

national levels that were not considered in this research (e.g. political initiative), or these e-government indicators are fundamentally independent of the country's performance.

Particularly questionable are the very low correlations of e-government usage by enterprises with performance indicators. It seems that business has its own priorities and incentives for using e-government services [10]. This is a subject that deserves further research.

These results do not support or confirm our first hypothesis that the economic power of a particular country plays a crucial role in e-government development in EU countries. From a political point of view it may be a relief for economically less developed European countries, particularly the new EU member states. It indicates that they can successfully follow more developed countries on their path to the information society, at least in the area of government transformation. However, the most economically advanced Nordic countries and UK all have a very high level of e-government readiness. It can be seen that these countries significantly outperform all other EU member states in nearly all other e-government indicators.

A rather unexpected result is the low correlation between economic efficiency and e-government indicators (Table 1). It shows that e-governments still have a low or even no impact on economic performance, and vice versa. Even overall government efficiency has a low impact on e-government readiness (correlation is 0.57). The interpretation of the authors is that e-government systems are still in the early development phase and do not have a direct impact on the economy or even governments. It is clear that they are currently more politically than economically driven. This backs up the conclusion [1] that the e-government is still in the development period, which is still needed for the take-off of strong political support.

3.2 National Competitiveness and Innovation and E-Readiness vs. E-Government

National competitiveness and innovation have a significantly higher impact on e-governments as expressed by the Summary Innovation Index. Competitiveness is also significantly correlated with nearly all other e-government indicators.

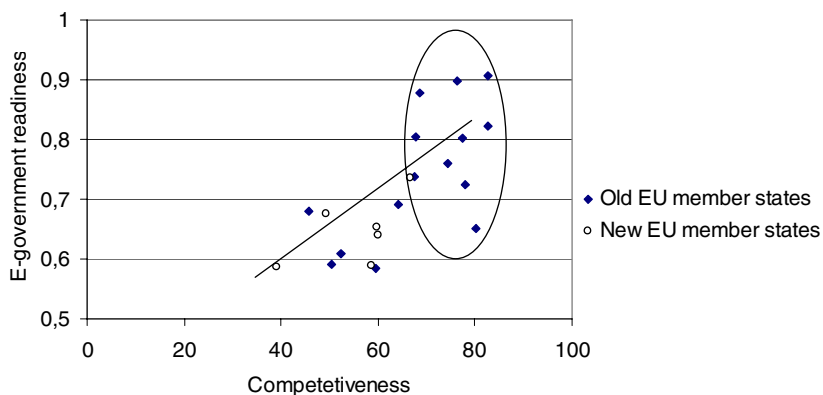


Fig. 3. Correlation ($R=0.71$) between competitiveness and e-government readiness (sample of 21 EU countries)

A plausible interpretation is that incentives for national competitiveness correspond to a significant degree to incentives for e-government development, and vice versa. Nevertheless, according to the authors' knowledge there is no published research that addresses the very intriguing issue of e-government impact on national competitiveness. What is also noticeable from Fig. 3 are the very scattered values for e-government readiness for a group of countries with high competitiveness. This leads to the conclusion that the political commitment to e-government fluctuates far more in competitive than in less competitive EU member states. It seems that some very competitive EU countries are still not very enthusiastic about e-government projects. The same conclusion can be drawn for some new EU member states.

Similar effect on e-government as competitiveness has innovation (Fig. 4). The correlation with Summary Innovation Index, which is a measurement for national innovation, is 0.86. It is high and statically relevant at the 0.01 level. The role of national innovation is a very seldom-mentioned issue in national e-government strategies, although many other research works confirm the vital role of innovation in all national development projects and public acceptance of new technologies and services [2][6]. Our results also point to one of the most notorious problems in the new EU member states regarding e-government, which is that their overall level of national innovation is significantly lower than the EU average, and this fact has a negative effect on their e-government development. It can explain difficulties in promoting and introducing new, publicly available e-government services.

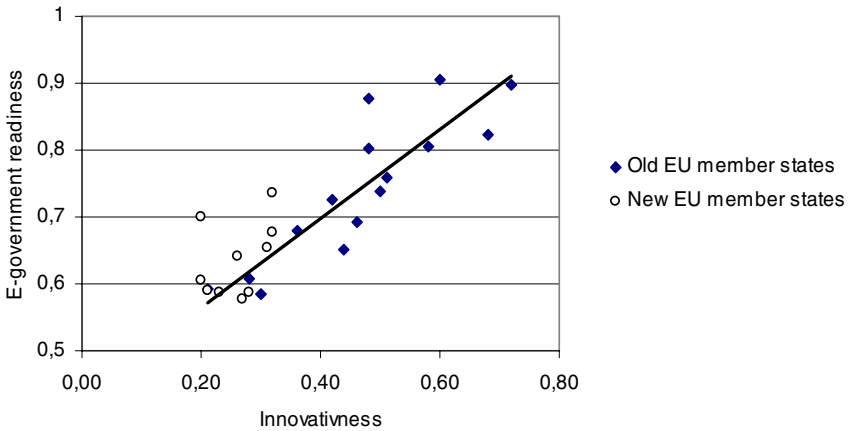


Fig. 4. Correlation ($R=0.86$) between Summary Innovation Index (innovation) and E-government readiness (sample of 24 EU countries)

A high correlation ($R=0.80$) between e-government usage by individuals and national innovation (Fig. 5) can also be noted. Public innovation and their consequent acceptance of all kinds of innovations makes e-government project easier to justify, promote and offer for public use.

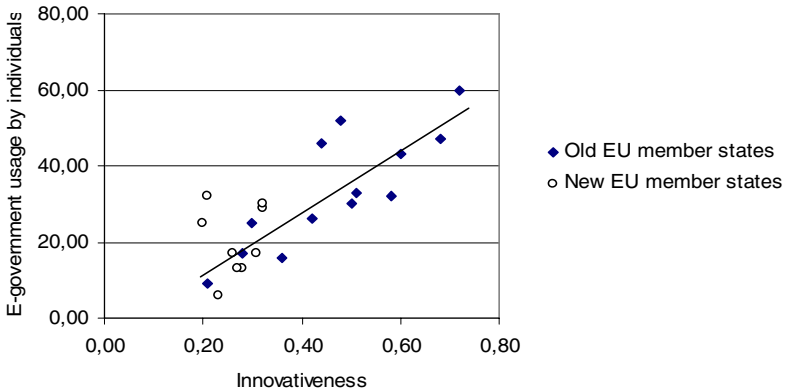


Fig. 5. Correlation ($R=0.80$) between Summary Innovation Index (innovation) and E-government usage by individuals (sample of 22 EU countries)

Once more some rather disturbing results are revealed regarding the new EU member states. They all show low innovation and low e-government usage by individuals. It seems that low competitiveness and low innovation could be a serious barrier to further e-government development in some of the new EU member states and also some of the old EU ones. Particularly intriguing is the high correlation between competitiveness and e-government usage by individuals. This indirectly implies that national competitiveness is also based on public attitudes towards new

services such as e-government. This issue deserves further research because public perceptions and usage of e-government projects remains an underestimated and under-investigated area in the majority of EU countries.

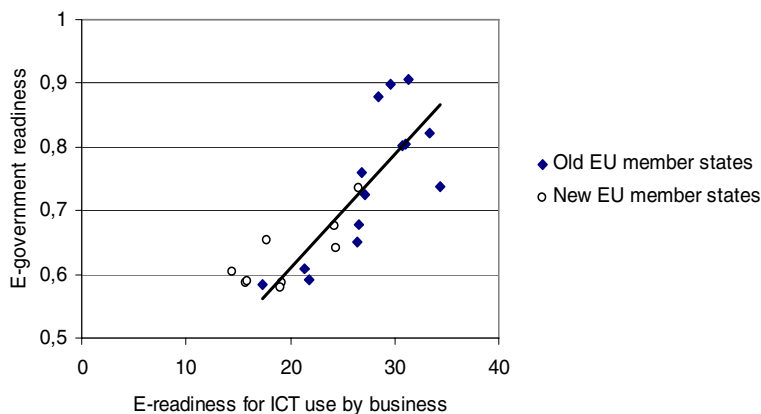


Fig. 6. Correlation ($R=0.83$) between E-government readiness and E-readiness for ICT use by business (sample of 24 EU countries)

One could argue that the role of business is even more important in the current e-government development phase than the role of the public. Enterprises are still the major users of e-government applications. Fig. 6 confirms the assumption that e-government readiness positively stimulates business readiness to implement and use ICT. It could be also vice versa. A positive business attitude towards ICT makes it easier for governments to introduce and politically justify ambitious e-government projects.

As seen in Table 1, e-government readiness is strongly dependent on nearly all economic performance indicators. This means that it is a complex variable, requiring a multidimensional approach. Nevertheless, the authors agree with researchers who consider e-government readiness, as accepted in the EU, as an indicator with a limited power to express the e-government maturity. More complex indicators are needed to express the complexity of e-government status and its impact on the economy and society.

Figures 3 to 6 confirm the second hypothesis that a positive socio-economic environment significantly influences e-government development. These indicators proved to be more relevant than current economic condition. One could speculate that similar financial investments into e-government projects give different results in different environments.

3.3 Government Efficiency vs. E-Government

Table 2 presents the correlations between e-government readiness and other e-government indicators. A significant correlation with e-government usage can be seen with individuals and also with e-participation. On-line sophistication has lower

Figure 7 illustrates such clustering by the two criteria: e-government usage by enterprises and individuals. It also gives some insight into the users' side of e-governments project in the EU. We can notice a "low-low" situation for majority of the new EU member states, and low individual usage – high enterprise usage for a mixed group of countries. In the high-high group we see three new member states that hardly joined this group of the most successful countries that are all above EU average by both criteria.

This third and the final hypothesis was also not confirmed. Current government efficiency has a small impact on e-government readiness and on other e-government indicators. The correlations are in a range from 0.29 to 0.69. This is something that policymakers should certainly consider. It seems that general government efficiency is not high enough on e-government priority lists, or that the present impact of e-government projects is much lower than expected. Governments should more carefully balance the real needs on one hand and political or more demonstrative intensions on the other.

4 Conclusion

The results of our study indicate that e-government only moderately depends on the level of economic development. The only positive exceptions are the Nordic countries and the UK. This finding contradicts some other research that was made on different samples of countries. There is not enough empirical evidence available to go into detailed explanations, but new EU member states in particular show unique behavior in many aspects. It is also obvious that in the majority of EU countries, e-government is still more of a politically than economically or even government-driven project.

Some other national performance characteristics such as competitiveness, innovation, readiness to use ICT, and internet access are much more significant. This points to the second conclusion that overall socio-economic readiness plays a critical role in e-government development and acceptance by individual users and business. A positive public atmosphere stimulates politicians and governments to initiate projects and also stimulates use of e-government services. National innovation and competitiveness are particularly strong drivers. The authors would also argue that this aspect of e-government is far too neglected as an issue by policymakers in some countries. This can be seen in the new EU member states, which went through radical changes in their governmental system when adopting EU regulations and undergoing the EU accession process. Their political attention and resources were focused on these issues and much less on the promotion of new services. Nevertheless, some of them are doing very well in e-government implementation.

It is surprising that the research could not confirm the third hypothesis that general government efficiency would significantly correlate with the e-government development. The authors' interpretation is that in the majority of EU countries the e-government projects are still in their initial development phase and have a low impact on their surroundings. Only the most developed EU countries like the Nordic countries and the UK are already capitalizing on their e-governments. Others have not yet passed the threshold that separates e-government as a politically-driven project on the one hand, and government and user-driven projects on the other.

It was interesting to put all the selected e-government indicators into a broader perspective. E-government readiness and e-government usage by individuals show the highest correlation with the national performance indicators. This means that both areas can be improved by many different mechanisms at the national level that fall within government competence. On the other hand, business motivation for e-government usage and e-participation are much more resilient to government incentives.

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A European Perspective of E-Government Presence – Where Do We Stand? The EU-10 Case

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Abstract. It is widely perceived that the nature of ICT is changing and so is the scale of the resulting economic and societal impact around Europe. Continued and accelerating technological progress, market changes arising from globalization and convergence, and a growing societal acceptance of the new technologies, amount to a step-change in what it is able to be achieved with ICT. This paper tries to identify the current status and the progression achieved so far in EU with regards to the eGovernment area. Specific reference is being made to the EU-10 case, attempting to pinpoint the level of eReadiness progression achieved in recent years. It further detects accomplishments and shortcomings as well as further drivers and barriers shaping the current situation towards the apt EU alignment.

1 Introduction

In recent years, the information technology revolution has induced transformational economic and social shifts around the world. New technologies are likely to continue to have a profound impact on the political, economic, social and cultural values of the world in the coming decades. Economic opportunities will continue to abound in marketing and purchase, enabling businesses to increasingly link in global supply chains without care of geographical distance or time zones. Social and cultural distances around the world are likely to shrink even further leading to multi dimensional citizen groups which are more competitive, more democratic and more flexible. To ensure unlimited economic and social frontiers, a huge global information infrastructure is being put into place in many countries for the future. Many governments have tapped new synergies between technology and development to find innovative solutions to economic development and social cohesion. Developing countries have made considerable progress in expanding information technology tools and putting in place physical networks. Indicatively, telephone subscribers account for 49% of the total subscribers in the world, up from 19% in 1990; while, as a whole, own 30 % of the computers today compared to 20% in the early 1990s; and 34% of world users now reside in the developing countries up from a mere 3% in 1992. To provide an enabling environment, governments are investing in policies and programs for building supporting economic, social and regulatory infrastructure which will allow them to take full advantage of the benefits of the impending information society [1], increasing public value. The creation of public value is a broad term that encompasses the various democratic, social, economic, environmental and governance roles of governments.

This paper aims at presenting the current situation in Europe with regards to eGovernment field. It presents the relevant qualitative and quantitative data analysis from various reports, developing a meaningful assessment for the specific area. Furthermore, a special emphasis is placed in the EU-10 progression eReadiness alignment, stating the trajectory factors of eServices development. The main drivers and barriers as well as achievements and shortcomings are overviewed in an attempt to draw relevant and safe conclusions in terms of challenges and implications for the future.

2 Major Policies and Priorities for eGovernment Developments

The global evolution of eGovernment is a reflection of technical developments, competitiveness and efficiency pressures and the need to modernise public administrations. The eGovernment is expected to raise the quality of public services and reduce the costs of their provision, lead to more transparent government. Besides these generally expected outcomes there are special European issues that drive eGovernment, including the promotion of economic growth and employment within the Lisbon process, stimulating innovation and human capital development and meeting such longer-term challenges, as the generally observed aging of European societies, increasing internal and external migration within the EU-25 among others. There are two reasons for the need of European wide eGovernment policy. First, besides local and national issues there are also ones, which should be addressed at European level, including as privacy, security, interoperability and ensuring equal accessibility of services to all citizens. Moreover, the diffusion of technologies, the deepening of the Single Market leads to new cross-border services, which could be developed to support European citizens and businesses. Second, national, regional and local governments can learn from mutual experiences, stimulate the spread of best practices, and foster the development of the best eGovernment systems.

The Manchester Ministerial Declaration [3] approved in November 2005 set four major priorities for policy makers in the area of eGovernment. One of them was the need to have “no citizen left behind inclusion by design”, the second goal was to use ICTs for more effective and efficient government, the third one set by the Declaration was to deliver high impact services reflecting customers’ needs, and finally, the Declaration emphasised the need to have widely available, trusted access to public services across the EU through mutually recognised electronic identifications. This requires that by 2010 European citizens and businesses shall be able to benefit from secure means of electronic identification and Member States will agree on a framework for reference to and where appropriate the use of authenticated electronic documents across the EU. In line with this change the recently adopted i2010 eGovernment Action Plan: Accelerating eGovernment in Europe for the Benefit of All has emphasised five major objectives for eGovernment with specific objectives for 2010, which are crucial for the accelerated expansion of eGovernment [4]. The main priorities of the i2010 have been reflected in the latest Riga Ministerial Declaration [5], based on which it is possible to determine those areas, where the

European policies put an enhanced emphasis and where significant developments should take place in order to meet the above mentioned general goals. These areas are good governance, interoperability, local and regional services, e-Democracy and mobile government.

3 Global eGovernment Readiness Status

The evolution of eGovernment is presented with the results from recent worldwide surveys on eGovernment carried out by the United Nations [1]. In eGovernment readiness 22 of the 25 top countries are from the high-income developed economies. Of the 25 countries, 18 are from North America and Europe; 3 from East Asia (Republic of Korea, Singapore and Japan); 2 from Oceania (Australia and New Zealand); 1 from Western Asia (Israel); and 1 from Latin America (Chile) [1, 6, 7]. The United States of America led the 2005 global eGovernment readiness rankings index (0.9062) followed by Denmark (0.9058), Sweden (0.8983) and United Kingdom (0.8777) and the gap in services between Denmark, Sweden and the United Kingdom is further closing the gap in services with the United States (see table 1). The dominance of high and middle-income countries in the top 50 indicates that eGovernment readiness in a country is related to income. As expected high income countries have the resources and the platform of infrastructure to build on the potential of information technologies. In the last decade these countries have invested considerable resources in eGovernment, which is reflected in their higher eReadiness.

Table 1. The eGovernment Readiness Index 2005¹

	Country	Index
1	USA	0.9062
2	Denmark	0.9058
3	Sweden	0.8983
4	United Kingdom	0.8777
5	Finland	0.8231
6	Germany	0.8050
7	Netherlands	0.8021
8	Austria	0.7602
9	Belgium	0.7381
10	Estonia	0.7347

In Europe (see table 2) Denmark (0.9058) continues to lead followed by Sweden (0.8983) and then the United Kingdom (0.8777).

Two things are notable in the performance of Europe. First, countries more or less maintained their relative global rankings with only marginal changes. Second, 32 out of 42 countries fell in the top 50 countries of the world in 2005, which means that except for 8, all countries of Europe have an eGovernment readiness higher than the world average.

¹ Source: UN Global eGovernment Report 2005.

Table 2. The eGovernment Readiness Rankings: Europe²

	Country	Index 2005	Global Rank in:		Change
			2005	2004	
1	Denmark	0.9058	2	2	0
2	Sweden	0.8983	3	4	1
3	United Kingdom	0.8777	4	3	-1
4	Finland	0.8231	9	9	0
5	Germany	0.8050	11	12	1
6	Netherlands	0.8021	12	11	-1
7	Austria	0.7602	16	17	1
8	Belgium	0.7381	18	16	-2
9	Estonia	0.7347	19	20	1
10	Ireland	0.7251	20	19	-1

3.1 Selected Global eGovernment Developments

While there are significant differences in the performance of the individual countries (as reflected by the previous tables), there are some commonly observed trends in the evolution of eGovernment worldwide. These developments may be divided to the following seven major points.

1. EGovernment differences are diminishing between the countries. This is visible from the major international (UN) or European (Cap Gemini) surveys [1, 7].
2. EGovernment providers start to enjoy the savings from their past developments. Governments' initial objectives for their online programs were to provide service improvements and alternate channels of delivery [13].
3. Promoting take-up is still a priority. While there has been a sizeable increase in the usage of eGovernment services, most statistical data confirm that eGovernment currently is far from being used to its full extent.
4. The integration challenge of services is changing. Interest in horizontal integration has been apparent for some time; what is new are decided efforts to integrate vertically—across national, state / regional and local levels of government.
5. Acceptance of the view that traditional “eGovernment” is not citizen-centric. Many starts to share that the traditional way eGovernment was provided is far from being driven by the needs of citizens.
6. Personalization of eGovernment services is emerging. The major driver now is towards providing personalized services through better understanding of the needs of customers [11], utilizing the opportunities offered by the technology and streamlining public services.
7. Changing business models in public administrations. The ultimate goal is total government service transformation, where Internet-based technologies alter the delivery of government services so dramatically - and improve them so radically - that some old service models disappear completely.

² Source: UN Global eGovernment Report 2005.

3.2 The ICT EU-10 Alignment Progression – Achievements and Shortcomings

Based on various reports and extensive researches conducted in recent years [6, 7, 8, 9, 10], it is possible to determine some general achievements and shortcomings of eGovernment developments in the EU-10, outlining the degree of progression with regards to their alignment with the international spectrum and more specifically with the EU-15.

Initially, one major accomplishment has been the fast increase in the number of public services available online as well as the upgrading of the level of this availability. Similarly to the advanced European countries, the EU-10 focused their policy priorities and scarce resources at the development of the 20 major public services (12 for households and 8 for businesses) listed at IDABC³ (see Fig. 1). The online sophistication is expected to increase in the EU-10 from 55% to 70% between 2004 and 2006. While the level of online sophistication is still lower than in the EU-15, the gap has declined significantly and the rate of growth in EU-10 has exceeded its rate in EU-28 including also the advanced but non-EU part of Europe (Norway, Iceland). Within that there were some countries, which have been able in recent years to raise their indicators very fast (Latvia, Slovenia, Hungary), which allowed them to improve their relative position in Europe and also worldwide. Besides increasing the number of public services available online, these countries have simultaneously raised the level of online interaction with public authorities providing these services. The average of public services available fully online (meaning either level three or level four of interaction) is expected to increase from 28% in 2004 to 4% by the end of 2006, with 40% and 50% for the same figures respectively in the EU-28. At the same time the average level of interaction in eGovernment has increased in recent years significantly: the average for the EU-10 for the households sector in 2005 was 1.8 and for the business sector 2.6 on the four level scale. In case of the business sector this level is in line with the EU-15, while in case of households the gap is still considerable.

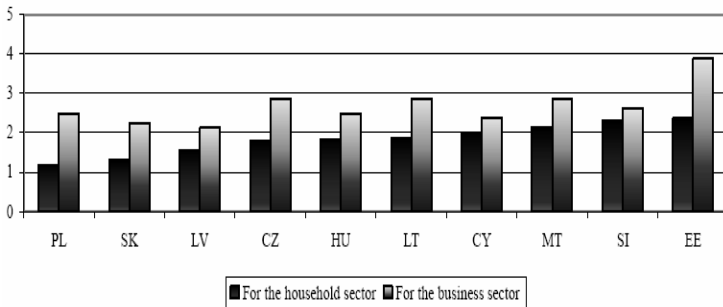


Fig. 1. The Average Level of Provision of eGovernment Services⁴

The increase in number of public services available online has been accompanied in the majority of countries by significant improvements in front offices, leading to more

³ <http://www.ec.europa.eu/idabc>

⁴ Source: EuroStat (2006), IDABC (2006).

user friendly, transparent, in many cases internally integrated services. Public authorities put in the last two years bigger emphasis at developing front offices with the purpose of catching up to the measured indicators of the European Union and improving the scope and quality of public services available online. Closely related to the expansion in the number of online services has been the fast rise and comparably high level of usage of online public services both by the household and corporate sectors (see Fig. 2). While usage depends on various factors (including penetration, affordability and cost of access), the role of content and available eServices should be considered also as an explanatory factor. In case of corporate sector, the percentage of companies interacting with public authorities online was on average by 10 percentage points higher in the EU-10 than in the EU-15 (with 59% and 50% respectively for 2005).

In case of households, the level is still higher in the EU-15 than in the EU-10, but it has been gradually decreasing thanks to fast rise in the EU-10, where it reached 15.5 percentage points of all households in 2005. There are certainly big differences among the EU-10 in both indicators: in 2005 the percentage of households interacting with public authorities online varied between 3.3% (the Czech Republic) and 29% (Estonia), while in the case of the corporate sector the level varied in 2005 between 32 % (Latvia) and 69% (Slovenia).

An important achievement has been the presence of relatively concentrated efforts at eGovernment developments compared with other areas of information society. Governments have developed policies at increasing the number and level of online available public services, started to harmonise the services provided by various public institutions, tried to upgrade the level of infrastructure available for public institutions and administrations providing eGovernment services. Moreover, the EU-10 have progressed in establishing the appropriate and supportive legal background for eGovernment. Last but not least an important achievement has been the development of the basic infrastructure needed to provide online public services.

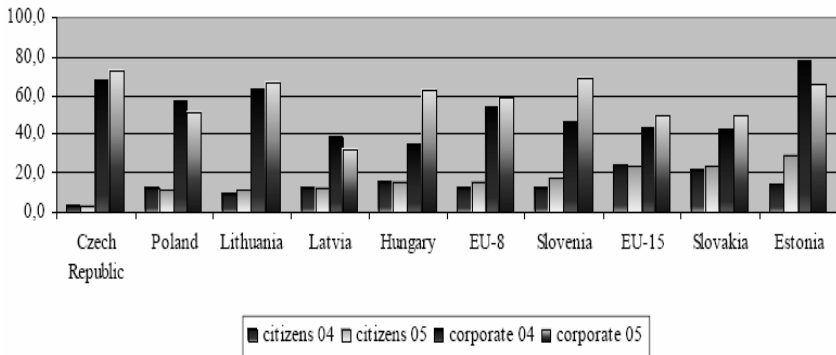


Fig. 2. The Percentage of Citizens and Enterprises Interacting with Authorities On-line⁵

While the EU-10 may present various though different and country specific achievements in eGovernment, there are still several shortcomings that characterise

⁵ Source: EuroStat (2006), IDABC (2006).

online public services. First, while there has been a significant increase in the number and level of services provided the scope of public services available online is still limited and not, in many cases, driven by the attention devoted to the needs of users. Closely to this, there is a general trend in the EU-10 that the provision of income generating services has far outpaced the level and extent of the provision of registration / return and permits services. The limited number of services is also due to the very unequal level of development in the provision of services. Furthermore, there is fragmented and scattered development, which is observable at various domains and areas. First, many eServices are not integrated inside the central government and among various general government institutions. Second, the providers of eServices are fragmented, the online development of their services is uncoordinated: they develop different and frequently not interoperable hardware, software applications and different platforms. Further shortcoming of eGovernment in the EU-10 is the quality of services provided by local governments. While there are significant differences among the individual countries, altogether local governments and their institutions lag behind the development of online public services. A serious shortcoming of eGovernment developments in most of EU-10 has been the limited scope of back office reforms and related institutional and organisational changes [14]. Most of the developments have been concentrated at developing and upgrading front offices. Related to the reorganisation of back offices, in EU-8 the opportunity was missed so far to connect the development of eServices with the reform or public sector, which would include redefinition of the role of the state, changes in the institutional and organisational framework in which public services are provided, and reorganisation of the public sector institutions. Eventually, while the achievements in the area of eGovernment include the more focused and concentrated developments compared to other online services, one major shortcoming and future barrier can be the lack of appropriate “owner” of both information society and eGovernment developments. This is mainly due to the scattered policy structure and regular changes and redefinitions of competencies and authorities among the various public institutions and ministries.

4 Overviewed Drivers and Barriers of eGovernment Developments

The overall development of eGovernment is influenced by the presence of various drivers and barriers. The drivers are those current developments, which support the spread of online public services, while barriers are the factors that generally hinder it. The drivers and barriers depend on the nature of the public sector, the history of public institutions and eGovernment policies, the behaviour of agents and other socio-economic factors, so they are country-specific. However, the analysis of international developments has pointed at several commonly observed drivers and barriers, which affect the evolution of eGovernment in a more universal perspective, and are summarised briefly below (for the scope of this paper some of them may apply only to the EU-10 case):

4.1 Major Drivers

The major drivers of eGovernment are the perceived benefits of these applications. There are various benefits stemming from eGovernment, which are related to the performance of the public sector, quality of the output of public administration, efficiency and transparency of public sector activity. These benefits may be divided to the following groups: (a) *Increasing competitiveness*. eGovernment can provide a major contribution to increasing economic competitiveness at various levels of general government (local, regional, national and also Community level); (b) *Increased efficiency and policy effectiveness*. The changes made possible by eGovernment, such as the improved information supply and service levels, contribute to increase the efficiency of public service delivery, (c) *Reduction of process time and of administrative burdens*. The digitalisation of public services can significantly reduce the time needed to process and deliver a service, therefore saving time for both public administrations and their customers; (d) *Cost reduction*. EGovernment enables public sector to increase its service processing and delivery capabilities, while requiring less time and fewer personnel; (e) *Improved quality of information and improved service level*. Due to the use of ICT, the quality of the information supplied and held in the public administrations' information systems is rising. The direct input of data in electronic format by public services users reduces the number of errors and makes it possible to build quality management information systems; (f) *Increased openness and democratisation*. eGovernment gives citizens greater access to information held by public authorities: (i) Increased participation in the information society, and (ii) increased democratic participation.

4.2 Major Barriers

The major eGovernment barriers are such characteristics of legal, social, technological or institutional context which work against developing eGovernment at the EU level. They may have a double hampering effect on the evolution of eGovernment. On the one hand they may impede demand, by acting as a disincentive or barrier for users to engage with eGovernment services. On the other hand they may impede supply, by acting as a disincentive or barrier for public sector organisations to provide eGovernment services. The major barriers in front of the development of eGovernment are: (a) *Policy priority for the government*. It occurs very frequently that policy makers and government attach low priority to eGovernment in their public policies and resource allocation as other short-term constraints take away the resources and attention of policies; (b) *Lack of appropriate funding for eGovernment*. Another common barrier in front of eGovernment (applied mainly to EU-10) is the lack of appropriate funding available for its development; (c) *presence of digital divide*. The development of information society is accompanied by non-diminishing and frequently increasing level of digital divide (applied mainly to EU-10, due to the substantial variation in experience with ICTs across users, leading to different levels of trust and confidence in eGovernment), which generally characterises countries independently from the level of achieved services; (d) *Lack of appropriate management and coordination skills inside the government*. Government departments fail to agree and implement common procedures and standards to provide shared networked eGovernment services or if they don't coordinate the provision of services

leading either to overlaps or gaps in service provision; (e) *Back office inflexibility*. The success of eGovernment developments crucially hinges on the ability to reform back office procedures and streamline the bureaucratic procedures in the provision of public services; (f) *Lack of trust among the various 'players' of eGovernment service providers*. The major source of conflict stems from the need to collect data on individuals as the basis for providing services and fears of data surveillance or the inappropriate secondary use of personal information in computer databases. Furthermore, the lack of trust is also a barrier in front of the relationship between public administrations, citizens and other ICT actors, which may impede eGovernment developments, (g) *Poor interoperability*. The sources of the current problem are manifold. It happens frequently that the established online public services are difficult to use because of the inability to employ eGovernment services using devices (e.g. mobile phones or old personal computers) most easily accessible by particular users. The users have various preferences and abilities and eGovernment developments sometimes miss the most appropriate opportunity for access. Similar problems may emerge in case there are incompatibilities between newer eGovernment systems and older systems, and failure to agree and implement global standards (e.g. eSignatures identification); and (h) *Legal issues*. There are various legal problems that need to be addressed when developing the eGovernment applications, such as: the administrative laws, which slow down organisational changes needed to shift from the paper based to electronic case handling and project management, the privacy and data protection as well as the poor interoperability between eGovernment systems, due to the lack of standardization in electronic identification and authentication technologies.

5 The Impact and Consequences of eGovernment Developments

It is a difficult task to measure the effect of eGovernment developments on the major macroeconomic variables. The difficulties are partly connected to the fact, that ex post assessments require time series data, which are rarely available in this case because of the short time period of eGovernment developments and also due to the difficulties with measuring them. This is one of the major reasons, why direct impact assessments of eGovernment developments have also been rare in the EU-15 countries, which have a longer history of eGovernment developments as compared with the EU-10. Finally, the measurement of the effect of eGovernment developments on the major macroeconomic indicators is complicated by the lack of reliable relationship between the eGovernment developments and macroeconomic variables. While there is a general feeling that eGovernment increases the productivity of public employees and leads to more efficient public sector, the precise determination of this effect is difficult, because: (a) public sector output, and thus productivity is difficult to measure, (b) the effect of eGovernment is difficult to distinguish from the impact of other exogenous forces, and (c) there is a lack of reliable indicators measuring these links. Therefore, at the current level of eGovernment development it is possible only to determine some tentative links between eGovernment developments and their macroeconomic impacts, as stated below (applied to almost all EU-10): (a) Improving productivity and operational efficiency, (b) increasing investment in human capital and life-long learning, (c) cut of administrative burden for people and businesses,

(d) increase of transparency in public sector, (e) improvement of IT skills of administration staff, (f) reduction of decision making time, and (g) Non-economic benefits: increasing democratic participation.

6 Discussion

The eGovernment has been proving that it can influence positively public administrations to become more productive and offer citizen services for all, in an open and transparent way. The benefits of eGovernment can go far beyond the early achievements of online public services. It is essential that the public sector adapts its organisation and skills for a user-centred approach in which technology is serving people. There are, however, many barriers and obstacles to overcome and sizeable investments are needed. "Change processes in organisation and culture take time: it can take several years before the combined investment in ICT, organisation and skills deliver the full benefits" [2].

The EU-10 attempt to provide progress in their eGovernment status is a good example to understand based on which barriers the eGovernment process is currently impeded. Even if they are mainly reflected in the reluctance of policy makers to devote significant attention to eGovernment issues, there have been recently two positive changes. First, in recent years governments seem to devote more emphasis in their policies on eGovernment linked to institutional (public sector related ones), legal and regulatory, fiscal and financial, as well as infrastructure and technology measures. Second, as the entry to the European Union demanded, there has been an increased alignment of domestic policies and laws with EU guidelines and emerging opportunity to finance eGovernment related expenditures from Structural Funds.

EU-10, in particular, are called upon to provide political leadership and reinforce long-term commitment at all levels of government, and thereby contribute to providing Europeans with a world-class public administration that makes its full contribution to the Lisbon goals through high quality and innovative public services for all. There are various challenges towards that direction that could be taken into consideration. Part of them is related to the government aspects of eGovernment, namely, the reform of public administrations, streamlining of governments, redefining the scope and role of the public sector. The second area of challenges is associated with the development and usage of ICTs, while the last one with the technological developments brought forward in recent years. Main technological challenges (since they are considered of great importance into the whole progression and future European alignment), that need to be addressed regarding the development of eGovernment services are integration and interoperability (it focuses, in terms of integration, on interoperating of public organisational units, while, in terms of interoperability, the theme covers technical, semantic and organisation levels, as well as standards [15], in order to achieve seamless and joined-up activities which are device or platform independent and able to replace or cope with legacy technologies, architectures and systems), personalized services for all, user needs [12], and trust and security (covers tools, methods, technologies and policies of information assurance, and additionally addresses needs of privacy and identification). Other major challenges identified – while they also show country-specific differences – could be emphasized upon: Reform in the public sector, sustainability of public finances,

evaluating and benchmarking eServices focusing on the overall outcomes of eServices, public value creation, new business models, paper- based versus electronic procedures, security and ethical aspects, and technological challenges to mention but a few.

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