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Preface

The EGOV series of annual international conferences is dedicated to the numerous aspects of electronic government in both research and practice. EGOV showcases completed research, ongoing research, practitioner projects, and general-interest papers. For the fourth year in a row, the conference was anteceded by a doctoral colloquium. Like its six predecessor conferences, EGOV 2008 brought together scholars and practitioners from across the globe. This year, five continents and 36 countries were represented.

Along with the eGovernment Track at the Hawaii International Conference on System Sciences (HICSS), and the International Conference on Digital Government Research (dg.o) in the USA, the EGOV conference has established itself as a leading annual conference on eGovernment, eParticipation and eGovernance in Europe with a global reach.

In the "Call for Papers" this year, a number of topical threads were highlighted, which attracted 119 submissions. Among these submissions, which included full research papers, work-in progress papers on ongoing research as well as project and case descriptions, 32 full research papers (empirical and conceptual) were accepted for the LNCS proceedings of EGOV 2008. These papers have been clustered under the following headings:

- Strategies and Frameworks
- Transforming Government
- Assessment and Evaluation
- User Centricity and Inclusion
- Service Architecture, Interoperability and Application of Semantic Technologies.

The ongoing research and innovative contributions, case and project descriptions as well as workshop and panel abstracts, which were also accepted, are published in a complementary proceedings volume in Trauner Druck, Linz, Austria.

At quite a few conferences, "best papers" are recognized and awarded. EGOV deliberately takes a different path. We do not pretend to be able to objectively identify "best" papers for the lack of adequate and agreed-upon metrics in a overwhelmingly multi- and interdisciplinary domain of study with numerous and different standards of inquiry in the various disciplines. However, the EGOV organization awards outstanding papers, that is, papers which make a difference. Outstanding papers are recognized in three categories:

- The most interdisciplinary and innovative research contribution
- The most compelling research reflection
- The most promising practical concept

As of this writing the winners in these three categories of outstanding papers were not yet determined. However, the award ceremony has become a focal point of attention at the conference.

Many people make large events like EGOV 2008 happen. We thank the members of the EGOV 2008 Program Committee and additional reviewers for their great efforts in reviewing the submitted papers. Gabriela Wagner of the DEXA organization as well as the DEXA staff deserve special thanks for taking care of organizational issues of EGOV. Sebastian Wolf 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 2008.

The Polytechnic of Turin in Northern Italy hosted the 2008 edition of DEXA and EGOV. This fine Polytechnic University prides itself of a long tradition in scholarship and higher education, which encompasses schools of architecture, engineering, and a graduate school. Across schools and programs, information technology is a mainstay on this institution's scholarly agenda. For the eGovernment research and practice community this venue provides a natural home. We thank quite a number of local institutions for the support provided in the organization of the event. It was a pleasure to visit the wonderful city of Turin.

September 2008   Maria A. Wimmer
                                                  Hans J. (Jochen) Scholl
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Does the Answer to eGovernment Lie in Intermunicipal Collaboration? An Exploratory Italian Case Study

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Abstract. The paper analyses Italy's recent attempt to build new intermunicipal structures to support eGovernment development also in peripheral areas of the country. Preliminary findings for an individual region (the Piedmont Region) show that intermunicipal collaborations can facilitate the coordination of interdependent subjects, rationalize existing resources (e.g. through the use of application software solutions), and prevent the dispersal of government funds. At the same time, the new intermunicipal structures alone do not seem to have the authority needed to ensure that the decisions made by the technical round table participants will automatically translate into a concrete and binding commitment for all the municipalities potentially involved. The paper seeks to use the analytical frameworks offered by organization science to interpret the effects of collaborative arrangements on eGovernment implementation.

Keywords: eGovernment, ICT Management, Partnerships, Intermunicipal cooperation, Networks, Collaborative eGovernment.

1   Introduction

eGovernment is defined by the European Commission as the use in public administration of information and communication technologies (ICT) teamed with organizational change and the introduction of new skills, aimed at improving both public services and democratic processes and strengthening public policy support [5]. Therefore, eGovernment can be perceived as the use of ICT to bring the public administrations (PA) closer to the needs of citizens and businesses. The government level having the most direct contact with these latter is that of the municipalities, which are responsible for providing a wide range of public services, however, these same are those who are struggling the most to achieve full eGovernment implementation.

In addition, this problem usually goes undetected by official statistical radars since most efforts to benchmark eGovernment opt to use central or regional governments as their units of analysis [7]. As a consequence, the importance of closely monitoring the diffusion of ICT among the local administrations is often underestimated. Nevertheless, the municipalities need to do more than just offer the surface appeal of an online front

office (sometimes non-existent) if they want to deliver the quality and efficiency gains promised by eGovernment.

The current Europe-wide trend of creating networks and other types of intermunicipal collaboration is the result of specific actions to support the smaller municipalities and help them overcome three critical hurdles: the impossibility of achieving economies of scale in the launch of innovation processes; the lack of adequate professional skills; and the shortage of financial resources.

The networked character that also eGovernment policies are acquiring prompts us to ask: in what terms does associated management splinter away from other forms of organizational management processes? More specifically: on what basis can these "new forms" of organization help achieve what the local administrations have so far failed to do in the field of eGovernment?

Questions to which we can find no simple answer. To date, only a few researchers have investigated whether the provision of IT-related services through networks or other types of partnership (where the term 'partnership' defines a general inter-organizational strategy that, regardless of the legal form taken on implementation – e.g. consortium, alliance, associated management, etc. – leads to the collaboration of two or more public bodies) has contributed substantially to the diffusion of eGovernment. Generally, the current discourse says that collaborative models become detached from traditional forms of organization because they accrete the autonomy and peripheral competencies (of the partners) under the banner of a common goal (e.g., the setting up of a 'one-stop desk' to provide advice to businesses).

The emergence of intermunicipal cooperation in the eGovernment field opens the door to a broad research area where overlaps in ICT disciplines, organizational theory and policy studies can provide highly informative insights. Therefore, the objective of our exploratory study is to:

1. provide a general and multifaceted overview of intermunicipal cooperation;
2. describe and analyze some recent initiatives launched by the Italian government to favor collaborative arrangements in the eGovernment sphere; and
3. capture the overall sense of these new inter-organizational initiatives, regardless of the legal form taken on implementation. Indeed, we will use the analytical frameworks offered by organization science to try and interpret the case of intermunicipal cooperation in the Italian region of Piedmont.

The paper unfolds as follows. Section 2 reviews the literature on collaborative arrangements and seeks to frame the problem through different theoretical lenses. Section 3 illustrates our research methodology, the Italian scenario and the collaborative strategy implemented by the Piedmont Region. Section 4 offers our interpretation of the empirical data. Ultimately, Section 5 outlines our conclusions and indicates how the issues dealt with can be approached in future studies.

2   Review of the Literature

Collaboration has been viewed as a self-evident virtue for several decades, yet has remained conceptually elusive and perennially difficult to achieve [9]. In this article,

we use the term 'collaboration' and 'cooperation' interchangeably to signify an action aimed at achieving a common goal. On the other hand, we point out that the notion of coordination as referred to the organization of relations between subjects (individual or collective) who are related or associated in a process has a different meaning. We emphasize the importance of this distinction, given that these terms are not always clearly defined by different authors, making it hard to compare the results of their studies. Further, as we will see later, assigning superiority – in terms of greater efficacy in the delivery of services – to partnerships between PA over other organizational forms can lead to major interpretive errors.

Research has approached the theme of collaborative arrangements in the public sector since as far back as the Sixties. Many contributions take their cue from the studies on intercompany networks, with the aim of assessing the main types of networks, the organizational mechanisms supporting these, and the main variables that have been shown to influence network emergence and shape [8]. "Governmental organizations have discovered the limitations of the traditional 'command and control' models of public policy development and have increasingly participated in policy networks that straddle multiple sectors (public, private and voluntary) and organizations" [16]. Voluntary as well as mandated collaborative relationships (i.e. in which collaboration is imposed on separate organizations by a third party [16]:152) pose governance challenges. It is no coincidence that many studies have sought to establish whether the type of governance mechanism affects the success of the collaborative effort over time.

According to the mainstream, partnerships are expected to realize goals beyond the reach of unilateral action [4]: goals that range from the possibility of mobilizing critical masses of resources to the achievement of economies of scale to extending the service offering or to increasing third-party negotiating power (e.g. with suppliers). In addition, compliance with administrative, procedural, organizational and management standards should ensure the municipalities and their associated managements an optimized deployment of financial and human resources.

The main premise of the interpretive frameworks just mentioned is that the adoption of collaborative forms between public administrations is intrinsically "a good thing", "a virtue" [9]. That said, many authors (e.g. [10]; [13]; [15]) emphasize the shadow areas, the contradictions and implicit danger of certain over-optimistic readings. For example, the output from collaborative arrangements often appears to be negligible or the rate of output extremely slow. Even where successful outcomes are reported, stories of pain and hard grind are often integral to the success achieved [10]. The fundamental argument maintained by the critical contributions can be summed up as follows: despite its promise, inter-institutional collaboration is not in itself a guarantee of success. For instance, [4] found that partnerships suffered predominately from a mix of hierarchical and market dysfunctions (ibidem:64).

However, it is not our wish to tip the scales towards the negative experiences, but highlight the danger inherent mainstream thinking. We know that the eGovernment agenda is facing compelling changes, but we find it hard to believe that the organizational criteria underpinning inter-agency initiatives are truly new. In some cases, the new configuration serves to highlight, often symbolically – both inside and outside the public bodies involved – the adoption of a new logic. However, a formal "brand new" configuration is a highly imprecise indicator of the organizational

change underway. We believe that only by analyzing the room for action and decision generated by the overall regulatory process is it possible to clarify the extent and meaning of this organizational design effort.

Returning momentarily to the question of terminology, it is an unacceptable simplification to say that inter-institutional agreements are superior to other organizational forms because the collaboration between actors in a network is more efficacious than collaboration between separate actors. Above all, we need to acknowledge that cooperation can be found also in informal contexts, as we are taught by the well-known example of [1], taken from [17], of the two men rolling a stone that neither could have moved alone. The organization setting is distinguished by the "cooperation under way" (like that cited in the example), in that it is the action of intentionally rational predefinition aimed at building an order between the job structure and the social structure. By adopting an analytical distinction between "activities" and "persons", the organization is no longer "the art of doing things", but a process of bounded rational actions and decisions.

According to [18] the interdependencies between activities and between persons (in other words, coordination) can take diverse forms, which lead to increasing levels of complexity and cost. The need to coordinate leads to the introduction of mutually consistent rules on the methods and timing of the carrying out of jobs and on the methods for governing the relations between actors. Nevertheless, we point out that the action of these latter can always shift away from those rules, resulting in the introduction of factors of structural variability.

Obviously, all this has implications relevant to understanding partnerships. Saying that the network configurations are intrinsically "good" because they are less binding (or 'more flexible') for the actors involved means confusing the different analytical levels. Instead, we need to take into account that the organizational action always produces constraints for the individuals. In any event, it cannot fully exclude the ability of the cooperating actors to exercise discretion. Therefore, to report an effective change we need to focus on the processes of regulation and investigate whether and in what way do the nature (autonomous or heteronomous) of the organizational processes and the margins of discretion change.

Concepts that we have reviewed help us reinterpret the Italian case presented in the pages following. And, as stated in our conclusions, we believe that the push towards heteronomous regulation and the lower discretionary power of the municipalities predominates the current favorable scenario for eGovernment partnerships.

3   Research Methodology

This exploratory study on intermunicipal cooperation in the eGovernment field has the goal of developing pertinent hypotheses and propositions for further inquiry [20]. The work is based on the triangulation of a number of primary and secondary sources; we have also sought to balance the quantitative and qualitative data to further strengthen our analysis and contextualize the results. Given the role played by the regional administrations in the promotion of ICT innovations [19], we decided to investigate the Piedmont region, a case familiar to both authors.

Primary sources of data included a survey conducted in 2007 by the Piedmont ICT Observatory [14] on a sample basket of 590 municipalities out of a total of 1,206. Data was collected through online questionnaires and face-to-face interviews (with the smaller municipalities). The main purpose of the survey was to investigate the relationship between technological adoption and the level of local agency collaboration. An interview was also conducted with a domain expert in charge of the Local Agency Clusters (which go under the Italian acronym of ALI) to broaden our understanding of the issues involved and to check the coherency of the actual situation in the region and the interpretation of the results obtained.

We adopted three main sources of secondary data: i) a survey conducted in 2005 by CSI Piemonte [14] – the IT arm of the Piedmont regional government – aimed at understanding the IT needs of local municipalities; ii) a survey by the National Centre for the Computerization of the Public Administration [3] on the state of the art of the Local Agency Clusters across Italy; and iii) extensive review of the literature and desk research to favor a multi-perspective approach.

3.1 Background

Italy's campaign to strengthen eGovernment in its *Regioni* and other large urban areas risks cutting out the small municipalities from the distribution mechanism of what is a steadily shrinking resource pool. The so called 'ALI-CST Project', launched in 2006, has the objective of creating supra-municipal service structures capable of developing and supporting eGovernment processes and of guaranteeing that the administrations involved – above all, the small municipalities – are in a position to provide and manage services on an ongoing basis and receive the necessary human and technological resources.

A minimum of data suffice to understand the highly fragmented institutional scenario in Italy and the importance of this goal. Currently, more than 72% of Italian municipalities have less than 5,000 inhabitants, which makes it hard to imagine that the smaller local administrations have the capabilities needed to promote systematically (that is, in a non-episodic way) a service offering that meets the needs of their respective territories. Given that the major infrastructural projects are now complete (like those underpinning the national telecommunication networks that currently interconnect the PA based on common technical standards) it is time to diffuse eGovernment in a uniform but, above all, sustainable way.

The top-down design approach that has characterized the government's initiatives up to now – an approach that commentators say has helped many projects become self-referential and poorly aligned with the needs of either citizens or businesses – is set to be surpassed by other forms of locally based cooperation. Of course, that is not a complete novelty, given that partnerships have always been forged in the Italian landscape. So, what has changed? The peculiar fact that, while in the past collaboration between the institutions was seen as an opportunity, today cooperation is seen as fundamental [6].

Recent provisions enacted by the Italian government oblige the local administrations to pursue institutional cooperation or lose the co-financing awarded to their innovation projects. September 2005 saw CNIPA publish a nationwide call inviting the interested agencies (regions, provinces, municipalities, unions of

municipalities, mountain communities, etc.) to state their willingness to aggregate and work in partnerships to enable the launch of eGovernment initiatives at local level. That preselection process produced 64 suitable associations that have adopted different formal configurations. Figure 1 shows that the *Convention*, i.e. the easiest form of agreement to implement, is the most popular form of aggregation chosen by the local administrations, while the incorporation of a new limited company or a new public body are the least common choices. In February 2007, CNIPA issued its call for the selection of projects to finance out of a total of 50 projects submitted by the associated agencies. Those projects encompass more than 19 million citizens, of which 6 million live in municipalities of less than 5,000 inhabitants.
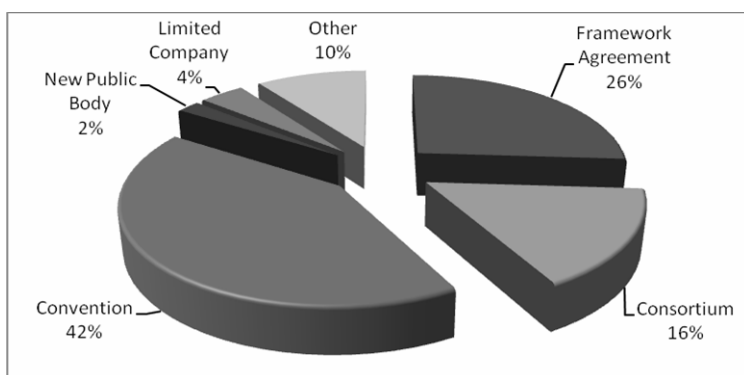
Fig. 1. ALI: types of formal configuration adopted in Italy (Source: [3])

3.2 Intermunicipal Cooperation in the Piedmont Region

The *Regione Piemonte* in Northern Italy is characterized by a high level of administrative fragmentation and population dispersion. The region has a total of 1,206 municipalities, 90% of which have less than 5,000 inhabitants. More than 40% of Piedmont's population live in small low-density municipalities, scattered over mainly mountain and hill territory. These factors all pose a major challenge to the creation of an ICT-friendly environment outside the main metropolitan area of Turin that features a homogeneous offering of broadband and eGovernment opportunities.

The current eGovernment situation in Piedmont can be described as follows: 70% of municipalities have websites, but only 23% use them to provide services. The slow pace of growth in web-based front offices between 2002-2005 saw the percentage of municipal websites rise from 40% to 50%, although the pace has accelerated slightly in the past two years, mainly thanks to the arrival of a few private players in the local markets. These players have exploited economies of scale by proposing a 'one size fits all' strategy and a highly standardized offering to the municipalities.

However, while eGovernment diffusion now seems to have picked up, a new and even more important challenge looms on the horizon, that of addressing the lack of ICT penetration in the back offices (highlighted by the low percentage of interactive websites). The major role played by the tourism industry in many of Piedmont's local

economies has meant that eGovernment has been mainly used as a marketing tool. In addition, the problem is exacerbated by organizational weakness - attested to by the fact that only 25% of municipalities have dedicated IT-management staff – deterring these latter from taking up the challenges inherent extensive deployment of ICT in the internal processes. Finally, the low presence of back-office IT systems also characterizes many mid-sized municipalities, making this a priority.

In 2005, the regional government decided to address the ICT impasse by upgrading its portal into a platform (*Sistema Piemonte*) enabled to provide both front- and back-office services to local agencies of all sizes. From a technological and economic viewpoint, the choice seems highly appropriate. On the one hand, it favors cost-rationalization through shared IT development and maintenance in both the front and the back offices, while, on the other, it promoted a more mature diffusion of eGovernment with the advantage of a single point of entry for all public services to final users (citizens and businesses). Despite this, the diffusion of e-services among local agencies has not gained the expected momentum. That is due in part to the subsidiarity principle that guides regional government actions, which, in essence, means that these latter cannot be imposed on the local agencies, who, in turn, are reluctant to relinquish their autonomy, and in part to the fact that the municipalities have yet to develop an IT culture that would enable them to understand the benefits that such an initiative would bring to all stakeholders.

The Piedmont Region started to adopt a systematic and integrated approach to public IT-management in the Seventies, leading to the creation of the CSI, a body charged with providing support to local public agencies and bringing together PA and academic institutions in the quest for a more optimal management of public-sector IT. In addition, CSI is the vehicle through which the regional government implemented and currently manages the *Sistema Piemonte* platform of eGovernment services.

As the reader can surmise, the ALI initiative launched by the national government overlapped with the support activity promoted by the regional government through CSI. It is not the first time that the municipalities have encountered a hurdle in their long history. Indeed, we can find many instances where intermunicipal collaborative arrangements have been implemented to solve more traditional problems. These existing arrangements created in time have, as a result, increased the complexity of the scenario in which the ALI initiative had to be adopted. Piedmont currently features two types of municipal partnership: the first aims to address issues inherent the management of mountainous territories (preservation and promotion of the area), while the second was created with a more specific goal, that of sharing the provision of some administrative functions.

The first goal in adopting the national policy at local level was to avoid the duplication of costs deriving from, on the one side, the creation of a new institution with new headquarters, board of administrators, etc. and, on the other, an overlapping of the investments already sunk into the *Sistema Piemonte* platform.

The regional government decided to embark on three key lines of action. The first calls for the reuse of 11 types of e-services - launched earlier with the financial support of the national eGovernment plan of 2002 - provided through the legacy *Sistema Piemonte* web portal. The second calls for the diffusion – via the same platform – of an application software for the land registry. The third initiative

revolves around the setting up of a new team of experts (or "facilitators") responsible for providing technical assistance, ICT advice and staff training to the municipalities. An example of the importance of the role that facilitators will play can be found in the fact that only 22% of municipalities currently provide some sort of ICT training to their staff. That percentage is indeed low when we take into account that the regional government offers free ICT courses to all the employees of the small municipalities. Raising the level of IT literacy and "e-readiness" is prerequisite to the success of any policy aimed at promoting the mature use of ICT in the public sector.

Piedmont's municipalities paid significant attention to the ALI initiative, prompting 88% of them to join one of the eight ALI. A result that we believe indicates an unexpressed need in this direction. Nevertheless, we point out that no cost was incurred in joining the ALIs, which might have helped their success. The local administrators were attracted to the ALI mainly thanks to the potential it gave them to: i) expand the range of services provided; ii) reduce ICT costs; iii) access innovation-related funding; and iv) improve supplier management.

Figure 2 illustrates the services that specifically interest the local agencies and, above all, underscores how all the municipalities rate access to land registry services a top priority. That fact can be traced to the key revenue-generating role of the land registry.

In terms of the small municipalities, the priority flagging of website development and management reflects the increase in outsourcing practices. Unfortunately, the municipalities' lack of technical skills means they need to ask the ALI's support to manage the ICT contractors. However, in the larger municipalities, such a complete lack of technical skill does not translate into the same level of urgency. Nevertheless, the focus on land registry and eProcurement reveals that the approach to eGovernment is driven by a clear financial focus.
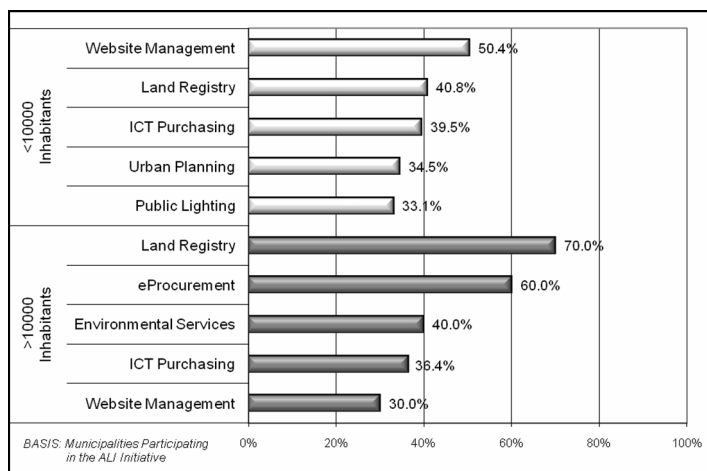
Fig. 2. Services ranked in order of priority by municipalities members of ALI (Source:[14])

4   Analysis and Discussion

In seeking to draw a preliminary picture of the phenomena investigated and provide orientation for further data collection and analysis, we propose below a possible interpretation of our observations.

The regional "eGovernment round table" of Piedmont has been generating good results since its inception some years ago and is an area in which the CSI plays a crucial role in spiking the interest of administrations in the ICT sphere. When the new ALI law came into force, the CSI had sufficient legitimacy to take a position at the helm of the process that had led it, in conjunction with the interested municipalities, to set up eight new units in the province.

The agreement forged between the CSI and the majority of the local administrations aims mainly to rationalize existing resources and prevent the dispersal of government funds allocated to Piedmont (€3 million) in a maze of uncoordinated micro-initiatives, where the amounts would shrink (to roughly €3,000 per municipality) and, therefore, would do little to help solve the problem for which the funds had actually been provided.

The adoption of a strategy calling for the reuse of the software solutions already on stream underscores the focus on economic sustainability. The web portal is the same channel through which the municipalities can access the land registry system. The setting up of a team of "facilitators" to assist the administrations not only with technical glitches, but also their innovation effort is a clear sign that CSI wants to promote a culture oriented to the building of a collaborative advantage, meant as the "synergy between collaborating organizations" [10]).

In addition to an overall rationalization of resources, the implementation of ALI in Piedmont aims to simplify the interaction between the CSI and the local PA, given the drastic reduction expected in the number of provincial "technical round table" participants. Nevertheless, we underscore that the choice of giving the ALI a formal yet relatively weak configuration – in the form of a framework agreement between the local administrations – risks being transformed into a problematic element. In other words, it is hard to believe that the decisions made on a case-by-case basis by the technical round table participants will automatically translate into a concrete and binding commitment for all the municipalities potentially involved. In the worst-case scenario, however, the absence of stringent restrictions could slow or even thwart the efforts to adopt common technological (not only in eGovernment) and, above all, organizational solutions. That worst-case scenario would result in the growth of technological heterogeneity and territorial differences. How these tensions and contradictions are addressed and solved will also be a critical factor in the effectiveness of the ALI.

An interpretive key that adopts the conceptual frameworks offered by organization science, and especially by the Theory of organizational action (Toa) ([11];[12]), enables us to explain Piedmont's choice in relation to its two main goals. The first is that of facilitating the coordination of inter-dependent subjects (the local administrations): sharing the same application solutions translates into the creation of standard rules and common practices that steer the action of the municipalities in the provision of services. That form of coordination is not only less costly than the others, but also makes it possible to evaluate and compare the provinces, for example, by

measuring the level of use of the e-services and the state of the work in progress. The second goal of enlarging the municipalities' IT resource pool through the introduction of a common land registry system reveals the CSI's intention of increasing the technical rationality of the administrative processes.

On the other hand, other service areas have adopted more complex forms of coordinating the inter-dependency of local administrations. Indeed, the staff training and sensitization activities that the CSI will provide to the provincial ALI require mechanisms of 'coordination by mutual adjustment' [18: 56].

This picture seems to point to significant growth in organizational complexity, a complexity that derives from the variety of the relationships forged at the diverse levels. In parallel, the Piedmont Regional Administration – via the CSI – is further reinforcing its relations with the municipalities. What remains to be seen is the logic of the regulatory framework on which collaborative arrangements between the public administrations are based. A theme that has always been a key aspect of academic reflection, as attested to by the literature indicated in Section 2, but which has yet to find a satisfactory response to the often contradictory situations found in reality.

The Italian government has charted a kind of "virtuous" course that should prompt the local administrations involved to believe in the consultation culture. There is a clear focus on identifying and spreading best practice both within and between organizations. Despite this emphasis on collaboration and on the freedom given the local administrations to choose the collaborative form they believe most efficacious, it is clearly the central government's wish to extend its control to spheres of activity that have never before entered its field of action.

Of course, we will not be able to give a founded reply to that question until the ALI implementation phase has been concluded (slated for 2009). The general questions that – according to TOA – must be asked are: do the organizational configurations (i.e. intermunicipal arrangements) change the heteronomous/autonomous nature of the regulatory (i.e. coordination and control) processes? In what way does the discretionary power of the administrations and the decision-makers change?

We need to take into account that the activity of the public administrations is largely shaped through legislative provisions. Any analysis must therefore consider that the premises leading to the various institutional decision-making levels in the organizational processes are broadly restricted by the law. The law also restricts the methods of coordinating and controlling the processes.

Overall, we can say that the government's decision-makers have made sure – through regulation – that the ALI implementers do not distort the nature of the legislator's choices. It is widely known [2], that implementation is considered the "black box" of policymaking due to the high number of adjustments and interventions that often characterize the "work in progress". At the same time, intermunicipal cooperation seems to leave a lot of room for discretion in terms of the methods used to achieve the established goals. However, these "windows of freedom" have a backlash on the existing constraints: in other words, if one level is highly regulated also the other levels will have few alternatives. Ultimately, the push towards heteronomous regulation and reducing the discretionary power of the local agencies predominates substantially in the current Italian scenario.

5 Conclusions

Intermunicipal cooperation is intriguing because of its paradoxical nature, which combines competition and cooperation, autonomy and interdependence [16:151]. That the popularity of this organizational choice in public eGovernment policies is set to grow even further is worthy of academic investigation, both to explain theoretically the effects on the administrations and their courses of action and to project the consequences of the alternative organizational decisions. The practical agenda calls for civil servants to understand the concrete implications of collaborative settings on the management of technology or on the evolution of the needs of citizens and businesses located also in peripheral areas of the country.

It is probably too early in the day to draw any conclusions from the experiences underway in Italy. The findings of our research work indicate that governmental action aimed at favoring aggregations and collaborations in the eGovernment sphere might help diffuse online services. Nevertheless, providing these services in an associated format is not a sufficient condition for ensuring the provision of an integrated offering to citizens and businesses. Recalling the words of [4:76], we suspect that the partnerships will not find it easy to solve this type of problem.

Our exploratory study has led us to develop an approach that is useful for not only analyzing but also evaluating intermunicipal cooperation in eGovernment. It differs from the prevailing orientations because it invites us to abandon the idea that partnerships between local public administrations is always synonymous with decisional decentralization and empowerment of the peripheral players. We believe that the conceptual proposal advanced in this paper, which assumes the need to focus our attention on the processes of action and decision that take place at the diverse organizational levels, can be useful and productive as it enables us to go beyond the simplifying interpretations found in much of mainstream literature.

Of course, the above does not rule out the existence of cases where the organizational solutions are bearers of innovative organizational logics. Only research in the field will produce conclusive evidence, on the one hand, of the effective diffusion of these solutions and, on the other, of exactly how many such cases have assumed the new forms merely on the surface. Our feeling is that this latter type of situation largely prevails.

Finally, we want to point out some of the limitations of this work, which, as clearly stated in the title, is an exploratory study based upon a limited set of empirical data relative to solely one Region. The findings that we have drawn from the study presented here need to be further studied and validated by systematic work in the field. The data gives us a point of departure, some 'food for thought'. Future research on intermunicipal cooperation in the eGovernment field will need to adopt a longitudinal perspective, given that we cannot assume that the relations between the local administrations will continue unchanged also in the future, when some of the current enabling conditions (i.e. the financial resources provided by central government as an incentive to aggregation) expire. Subsequent work will also focus on the comparative study of the effects of the intermunicipal agreements implemented in other Italian regions.

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Pacta Sunt Servanda but Where Is the Agreement? The Complicated Case of eCustoms

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Abstract. This paper examines the role of regulation in eCustoms. We made use of a novel methodological approach, syntegration, to obtain the views of experts from government, businesses, technology providers and academics about barriers and drivers of eCustoms imlementation. During the syntegration workshop, regulation was perceived as both a barrier and a driver and in this paper we present the arguments of the participants on this issue. In our analysis, we attempt to discuss the practical value from the syntegration workshop by reflecting on the power of regulation when we move from a national to an international context which is the arena for eCustoms regulation. Our conclusion is that although at a national level regulation can be a powerful instrument for eCustoms implementation, the power of regulation fades to recommendations and soft law the more we move to an international level, and thus, making it a less powerful instrument for eCustoms implementation.

Keywords: eGovernment, eCustoms, regulation, syntegration.

1 Introduction

Pacta Sunt Servanda (agreements must be kept) is one of the oldest principles in international law. Treaties in international law are based on Pacta Sunt Servanda and thus the consent of the parties to comply with it. In some cases it has however proven difficult to reach an agreement at an international level. That has been the case is in the domain of eCustoms. Whereas national governments are efficient in issuing rules and regulation on customs the same does not apply to customs and in particular eCustoms in an international context. One reason being that the cocktail of international rules and regulation and ICT standards is a complex one. In this paper we will discuss how customs regulation when traversing from a national context to an international context looses its power.

Regulation concerns most individuals and organizations because it is used by society as an instrument to influence behaviour to accomplish particular objectives [16]. Customs is an example of an area with extensive regulation. In modern societies customs is an important source of revenue and a mechanism of control of traffic of goods and it is subject to on-going regulation. Within the EU regulation of customs are clearly outlined. In 2001 a new strategy for customs was launched. The strategy "highlights the important contribution that customs makes in trade facilitation, the

protection of the financial interests of the EU, especially in the fight against fraud, the protection of the society and the harmonization and uniformity in customs procedures and treatments" [5]. Though the strategy sounds abstract in its wording it is very concrete for businesses and government which have to deal with it on a daily basis and implement it as part of their workflow in order to live up to the prescribed procedures.

The advent of eCustoms has reinforced the significance of customs practices and regulation because it similarly to other domains where ICT is introduced leads to new ways of working between government and businesses. Though EU has invested many efforts in harmonizing rules and procedures for customs (TAXUD) there are still national differences. To complicate matters much export takes place outside of the EU where yet other requirements apply. The implementation of innovative eCustoms solutions often require changes in the legislation, however in an international context this is often a very slow and political process where the time lag leads to that by the time the solutions are implemented they are not that innovative any more. The immediate objective of eCustoms implementation is to streamline practices e.g. by introducing Single Window thereby achieving efficiency. The reported project has as one of its aims to pursue and document this efficiency gain through eCustoms implementation.

The objective of this paper is to discuss to role of regulation in eCustoms. Based on data from a syntegration workshop [3] qualitative input is provided on how practitioners from government and exporting businesses, IT developers and academics view regulation. The discussions from the workshop show that regulation is both seen as a driver and a barrier for eCustoms implementation and furthermore that it plays a significant role in the view of the informants involved in the workshop. The workshop is part of a Living Lab of an EU project where the drivers and barriers for eCustoms implementation have been explored from various angles. The paper presents data from the syntegration workshop combined with observations from previous studies in the project.

In our analysis, we attempt to explain the findings from the syntegration workshop by reflecting on the power of regulation when it moves from a national to an international context. Our conclusion is that although at a national level regulation can be a powerful instrument for eCustoms innovation, the power of regulation fades to recommendations and soft law the more we move to an international level, and thus, making it a less powerful instrument for eCustoms implementation leaving the principle of Pacta Sunt Servanda in a blind alley because it is difficult to reach concrete eCustoms agreements.

The remainder of the paper is organized as follows. The next section discusses why eCustoms is a special case of eGovernment and outlines the concept of regulation. The following section presents the applied data-collection method, a syntegration workshop. Thereafter follows a section which presents data from the workshop. The penultimate section provides a discussion of the outcome of the syntegration workshop combined with observations from previous empirical work in the project. This leads to the final section which provides some conclusions and directions for further work on the understanding of eCustoms implementation.

2   Theoretical Background

eCustoms is a specific form of eGovernment that focuses on international trade, where "International trade is characterized not only by the physical movement of goods across national boundaries but by voluminous paperwork that captures information pertinent to identification, delivery, and government control of transported goods" [18]. The use of IT in support of customs aims at lowering the administrative burdens for companies and improving the control of the trade. The view fits well with how the benefits of IT implementation have been viewed in the context of businesses for decades [20]. eCustoms refers to the use of IS for those government-to-business (G2B) interactions (in the context of international trade) where the businesses are the regulated economic sector (as apposed to other initiatives, for instance eProcurement, where government acts as a customer). However, as international supply chains cross different government administrations which have developed their own systems, other characteristics such as government-to-government (G2G) collaboration and interoperability become very important for eCustoms too [15]. This illustrates that eCustoms cannot be narrowed down to G2B collaboration but is a far more complex concept. There are several other aspects that we observe in eCustoms which contributes to the complexity.

First of all, while in many eGovernment initiatives, the government is a facilitator of the IS developments, in eCustoms the government has to fulfill a dual goal of on the one hand safeguarding public concerns (e.g. collect duties, ensure health, security) and on the other hand facilitating economic activities (e.g. in the context of the EU-promoting EU as a competitive economic zone). Second, in eCustoms the international and even global dimension is very important. A lot of the customs regulations are defined by the World Customs Organization or at the European level and implemented by the national administrations and businesses. Furthermore, international supply chains usually cross a number of countries/economic zones. This means that businesses often involve different jurisdictions, which may introduce extra administrative burdens and furthermore lead to regulation and agreements which follow international law. Third, in eCustoms we have very high frequency of interactions between government and businesses. Submission of customs declarations to the government is a part of the regular activities of businesses operating cross-border. The interactions can take place numerous times per day and they are increasingly on a "per transaction" basis (rather than periodically). The resulting increase in administrative burden per transaction multiplied by the larger number of interactions between businesses and government puts higher pressure on both businesses and government to implement robust ICT systems. Inability of EU governments to efficiently clear the transactions brings inefficiency to supply chains, which may ultimately threaten the competitiveness of the EU as an economic zone.

This discussion illustrates that eCustoms is a specific form of eGovernment with its own specifics and characteristics which may require a different approach to implementation given that multiple stakeholders with different interests are involved. Some stakeholders possess the power of issuing regulation. But given their jurisdiction the regulation can not necessarily be enforced. At the national levels government has the legal power to impose solutions in eCustoms by making the electronic exchange of customs data obligatory [2, 17]. This has led to that the legal

power of governments has often been viewed as a driving force for adoption of national eCustoms systems.

The power of regulation is well studied among various academic disciplines [4] each adding different perspectives to the concept. In this context a pure legal approach is chosen and the following definition is applied: "regulation is the intentional activity of attempting to control, order or influence the behaviour of others" [16]. The definition encapsulates a common understanding of regulation as a steering mechanism in society. As stressed by Parker et al. this definition incorporates the three fundamental requirements for a regulatory regime: 1) the setting of standards, 2) processes for monitoring compliance with the standards, and 3) mechanisms for enforcing the standards. These requirements fit well with regulation of customs where standards are based on customs practices developed over decades, and where instruments for monitoring compliance with standards (customs officers) and mechanisms for enforcement (control and retention by authorities) are well known and can be observed in any dock area where goods are shipped to and from.

In an eCustoms setting two dimensions complicates regulation. Firstly the international dimension and secondly the IOS (interorganizational information systems) dimension. Although regulation has been found to be an efficient instrument for change and IOS diffusion at national level [9, 10, 13], the same force does not automatically apply at an international level because different countries have different rules and interests and furthermore different levels of control. Instead of rules it becomes necessary to implement treaties. This leads to a shift in the status of regulation. At national levels rules can be hard law which can be enforced whereas international law often have the status of soft law which is not enforceable to the same degree [8] and which rests much more on the principle of Pacta Sunt Servanda [11]. To complicate matters eCustoms is also dependent on IOS. The IS literature is rich on examples on the complexity of IOS implementation [14]. Adding an extra dimension of complexity eCustoms it is not only a matter of interorganizational systems it is also a matter of international standards and their ability to support exchange of data in a secure and readable format. It is not an impossible mission: Hong Kong and Singapore are examples of successful implementation and they have been the frontrunners with respect to the implementation of eCustoms simply by making it a requirement for exporting and importing to the territory [7]. Denmark has recently adopted a similar approach by making it mandatory to report import statements via electronic channels [2]. These cases show that it is possible to implement eCustoms based on regulation at national level but also that it is complicated in a wider international context.

3   Method

The syntegration process [3] was chosen as a method of knowledge exchange among the heterogeneous group of people involved in the workshop. The heterogeneity is mainly based on different experiences with eCustoms and different roles in the project. Some of the participants come from the national tax and customs authorities where they work with customs on a daily basis both on policy level and administrative level. Other participants come from exporting businesses which have to deal with the administrative procedures of tax and customs on a daily basis. Yet

another group of participants represent the consultancy industry. Consultants involved in the project are mainly software developers who focus on dealing with the complexity of interorganizational solutions when developing innovative systems supporting eCustoms. Finally, there are the researchers whereof some are senior faculty with long experience in IS research most of them in the domain of interorganizational systems and young researchers which have just started their careers in IS research. The purpose of a syntegration process is to enable the effective contribution of a wide variety of stakeholders to the discussion of an issue of major concern. It is a non-hierarchical approach that allows participants to contribute to the best of their ability to the discussions [3]. A syntegration process is initiated by a trigger question. In the eCustoms workshop the trigger question was: *What are barriers and what are drivers for implementation of eCustom systems?*

Twenty five participants contributed with concepts or keywords with the distribution of academics, consultants, business representatives and government employees of 10, 5, 4 and 7 respectively. Each participant was asked to write about three concepts or keywords on two PostIT-stickers one focusing on drivers and one focusing on barriers. This led to 79 and 75 "statements of importance" on barriers and drivers respectively. Different stakeholder groups have different vocabulary and add different meanings to terms. Some terms were easy to reduce to one item or to cluster the terms into one theme. That is the case with terms such as regulation, legislation, and rules. Other more abstract terms were put together in groups based on the interpretation of the person who generated the lists. The lists were constructed in such a way that twelve themes were generated which then constituted twelve discussion topics and groups.

Each theme was discussed for 45 minutes in a group where participants had been given different roles. Some were proponents, others opponents of the topics listed, and finally some were observers which had as their role to make minutes from the discussion. The current reporting only focuses on the items related to regulation. The reason for the particular focus is that several participants in the workshop pointed at regulation as both a driver and a barrier. Beyond this empirical focus it is further assumed by the authors that regulation is a core driver and barrier to eCustoms implementation given that Tax & customs authorities do not implement eCustoms unless there is a legal foundation and businesses are reluctant to implement substantial and burdensome changes in processes unless they are forced to do so.

4   Data from the Syntegration Workshop

4.1   Regulation as a Barrier

During the syntegration workshop, regulation was identified as the most important barrier for improvements in customs procedures. Some short but powerfully mentioned "regulation" as a barrier for implementation whereas others submitted statements such as discrepancies in national and international/ EU regulation. An interesting trend is the tendency to emphasize that regulation is created by technocrats but it is the practitioners which have to deal with regulation.

The statements led to a discussion theme on regulation as a barrier for eCustoms implementation including the following four overall themes: i) EU laws and regulations, ii) Differences in national legislation, iii) National and international regulation, iv) The international dimension, any decision on eCustoms has to be made at EU level or higher (UN level). The discussion themes led to the following discussion on regulatory obstacles and oberservateurs handed in the following reporting of the discussion:

The proponents argued that even though it is recognized that because of security reasons there is a tendency to strengthen legislation, which may create a situation of "Big Brother" conditions. However, the benefits of regulation are still stronger than the costs. The issues related to regulation were identified to be the whole reason of existence of the present project where the potential benefits are identified. It was observed that during our project things are already changing. One way to see the benefit of the EU regulation is that up till now EU regulation has been reactive but this approach has than to be more proactive. It was recognized that changing regulation is difficult and time-consuming. But at the same time it was stated that the world is better off with regulation, otherwise things would be more difficult. Comparing the EU situation to other regions in the world, or to the situation in the EU 15 years ago, trade in the EU is much easier now. There is a lot of fraud and criminal activity in the EU, which is a big concern and which has to be prevented via robust regulation. Furthermore, the reaction of the system is too slow. But we cannot force the system to go too fast, because that can be a threat to democracy.

The critics' response to the proponents was less positive; they stated that: regulation is a barrier for improvements in customs procedures. One reason is that the EU law is partially obsolete. The EU is trying to improve laws via harmonization which makes the implementation slow. Laws are complicated and expanded and establish bureaucratic procedures for businesses. There is a prudent need to collect what needs to be changed in order to de-regulate the domain. Due to differences in national legislations, it is difficult to change the EU law on a short term. Furthermore, there is the challenge to countries, which want to preserve sovereignty in their own customs legislation. Also the differences between more developed and less advanced countries are a problem. Along the lines of EU regulation, it is observed that the laws are made at the EU-level, but not practiced at that level. There is a discrepancy in the sense that EU issues laws and the countries practice the laws and deal with issues on a more operational level.

Table 1. Summary of discussion on barriers for eCustoms implementation

Proponents' arguments	Critics' arguments
• Change of regulation is time-consuming Regulation is a necessary obstacle if fraud and criminal activity is to be prevented • Democratic processes have to be observed when regulation is created – that takes time	• Regulation is a barrier for improvements in customs services because the rules are obsolete • Rules makes bureaucratic procedures which is an obstacle – de-regulation is necessary • Not all EU member-states observe the rules in the same manner

4.2 Regulation as a Driver

Regulation was also identified as one of the often mentioned drivers of eCustoms implementation. Discussion themes on regulation as a barrier for eCustoms implementation included: i) Political goodwill, ii) Uptake in regulations, iii) EU-directives - regulatory enforcement, iv) EU-directives strong pressures from US to introduce trade security, v) EU funds – projects and international exchange, vi) Harmonisation.

The proponents argued that regulation is the best driver for any uptake; it might sound naïve but direct rules and incentives are necessary. An example is the eInvoice law in Denmark. Due to the eInvoice regulation in Denmark a lot of businesses have started to implement mechanisms which support eInvoicing. Putting the right regulation in place is very important; the eInvoice is a good example of how a small initiative can stimulate further uptake of IT in businesses and government. The only problem is that it can be hard to get the regulation through, because making people to agree can be difficult, especially on a supra-national level such as the EU.

Table 2. Summary of discussion on barriers for eCustoms implementation

Proponents' arguments	Critics' arguments
• Regulation as the best driver for any uptake; rules and incentives are necessary • Putting the right regulations in place is very important, eInvoicing is a good example • It is difficult for people to agree on regulation, especially on a supra-national level	• Legislation can be burdensome for businesses • Regulations can be seen as threat to businesses and a source of extra costs • Question to ask is: What is the benefit and the real gain of legislation

The critics of viewing regulation as a driver for eCustoms implementation argued that legislation can, on the other hand, create a lot of trouble because it can be burdensome for businesses to live up to the directives. Therefore certain regulations can be seen as threats to the businesses which have to make investments in order to live up to the laws and regulations. It might be valuable to ask: what are the benefits and the real gains of legislation?

The discussions of drivers and barriers demonstrate that the participants in line with Parker et al. [16] view regulation as a steering mechanism in society but also that regulation is viewed as a burden rather than a support for businesses. In the following section it is discussed if this view realistically can be maintained in the context of eCustoms where the international dimension plays a core role.

5   Discussion

The outcome of the syntegration workshop indicates that regulation was perceived as the biggest barrier and at the same time as an important driver for adoption of eCustoms solutions. On the level of the individual participants in the workshop,

regulation was seen as a powerful tool which can constrain but at the same time enable eCustoms innovation and implementation. It was mentioned that through powerful regulation criminal activities and fraud can be prevented and some participants advocated that regulation is the best driver for any uptake and that direct rules and incentives are necessary to make successful adoption of innovation. These views support the idea that legislation is a powerful tool which governments have in hands. At the same time the concerns were raised that changing regulation is a slow and time consuming process, which is caused by different national practices, as well as the strife of countries to preserve their national sovereignty.
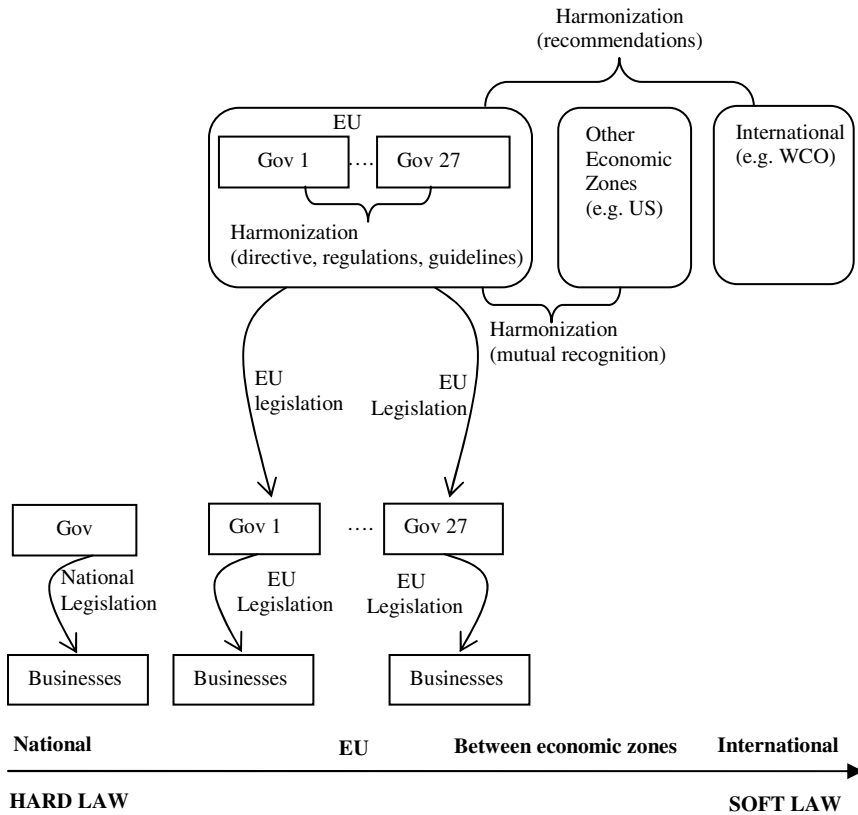
Fig. 1. The role of legislation when moving from national to international context

Below we attempt to explain some of the observations that were raised during the workshop and by doing so we strive to bring better understanding of the role of regulation for eCustoms innovations. If we look at eCustoms developments, we see a move from purely national developments towards developments in specific economic zones and even worldwide (see Figure 1). This is not surprising, as due to the processes of globalization, cross-border trade has acquired a truly international dimension. The implication of this is that the role of national legislation has very

limited impact on these global business activities. We will explore the move from national to international context (see Figure 1) by specifically paying attention on the role of regulation, in an attempt to better understand the developments in that area.

If we look at eGovernment initiatives at a national level like the above-mentioned eInvoicing initiative in Denmark, we can see that regulation played a crucial role in enabling the adoption of eGovernment solutions. The law for using eInvoicing was issued at a national level, it had direct power on the level of businesses and government officials had the law as an instrument to enforce the adoption of that solution. If we look at the EU as an economic zone, however, we see a different picture.

First of all, if we look at the law-making process, it is no longer the power of a single government to draft the legislation; 27 member states (see Figure 1) participate in the decision-making process and these need to harmonize their ideas and reach a consensus. During the syntegration workshop, time to agree on legislation was mentioned as an inhibitor for innovation. And it is not surprising, as achieving harmonization and agreement between 27 member states, which have followed different historical paths and have established different practices can indeed be a very time consuming process. A recent example of the development of the specifications for the EU-wide system for transit indicate that reaching agreement can take more than a year and the outcomes of these agreements are not necessarily beneficial for all the member states. Could this process be made faster? There is no straightforward answer to this question; as one of the participants pointed out, trying to accelerate this process might hamper the principle of democracy by surpassing regulatory bodies and procedures. While the legal changes in the EU require a lot of time, technology, on the other hand, develops very fast. In that respect, we might need to accept that bringing change in the EU legislation is a slow and difficult process and as a result, eCustoms innovations in the EU might not be developing as fast as desired and might not be using the most modern, state of the art technologies.

Second, if we look at the result of the negotiation processes, we often see legislation, which is a result of a political compromise. On the negative side, this means that the most innovative ideas might not be supported by political actors because their abilities are within politics and not technology cf. the classical Greek view on division of labour between politicians and administrators [12]. On the positive side, a political compromise can also mean that the interests of groups that would otherwise be disadvantaged would also be taken into account, which could ensure a more balanced view for the society as a whole and a more balanced pace of development of the EU as a whole. As a result, although progress will be made, it is less likely that innovative eCustoms ideas that are generated in the member states can be utilized at a maximum rate.

Third, if we look beyond the process of law making and the result of that process, we come to the next point, i.e. the power of the EU legislation. In the area of customs, for example we have the Customs Code, which discusses the issues at a very high-level and the implementation provisions of the Customs Code, which provide further guidelines of how it is implemented. While the Customs Code and the implementation provisions have a direct power in the member states, it is often not possible to put all the details using these instruments and thus how other instruments (e.g. "administrative procedures") are used to capture the further details. The other instruments however are

in the form of a soft law and are not legally binding for the member states even though the principle of Pacta Sunt Servanda applies. Thus, we see that although the EU has some mechanisms to impose law in the member states, these are limited. It is even more so when we talk about tax issues, where the sovereignty of the member states is even bigger. Thus, we can conclude that when we move from a national to a EU level, the legal instruments are weaker than at a national level, the time to arrive to these instruments and to change these instruments is longer and the result of that process is a political compromise between 27 member states. Although such process may facilitate improvements, it is less likely that it will enable the eCustoms innovations in the EU to develop to their full potentials.

Moving a step further from the EU, we see that different economic zones usually have different legislations. We observe that between economic zones there are attempts to first of all, achieve some level of harmonization in the legislation and second, to bring this harmonized legislation in power. For example, the US government has introduced a security certification program for compliant companies called C-TPAT [6], while in the EU, there is a similar certification program called AEO-security [1]. There will be attempts in the future to achieve harmonization between these two certificates. This however will be most probably in the form of a treaty of mutual recognition of certificates (soft law) rather than in hard laws. Ultimately, moving to a truly international dimension, we see that the World Customs Organization (WCO) is working hard in developing instruments for international cross-border trade (an example is the WCO Framework of Standards [19]). The WCO however has no legal power over the individual countries and the instruments developed by WCO can only be seen as recommendations and soft-law where compliance is based on the principle of Pacta Sunt Servanda.

Based on the discussion above we can conclude that although during the syntegration workshop legislation was perceived as a powerful instrument which can enable/ constrain the eCustoms developments the more we move away from the national level, the weaker the power of legislation becomes. When recognizing that eCustoms is an international affair the trust in regulation is problematic because what are left are only recommendations and soft law, which have no or limited legal power, only the principle of Pacta Sunt Servanda.

6   Conclusions

This paper aimed to explore what role regulation plays for eCustoms innovation and implementation. In our analysis, we made use of a novel methodology, the syntegrity methodology, to gain first insights into this issue. The syntegrety methodology has demonstrated that is has both strengths and weaknesses with respect to the collection of data from a heterogeneous group of people. The observed strengths include the benefit of getting several aspects related to drivers and barriers listed from people with different backgrounds and experiences with tax and customs processes. This led to another benefit because the distribution of participants in each discussion group did, in general, stimulate discussions which were relevant to all involved stakeholders, due to the balancing of representatives from government, businesses, consultancy and academia. Finally, it was also observed that because all had provided

input to the discussion groups, everybody felt some degree of ownership towards the topics, which resulted in strong involvement in the discussions. A weakness of the methodology is that the outcome of the workshop is a set of rich data, which needs further interpretation and digestion by the reader. It can be seen as a weakness that no item or theme has been identified as more or less important compared to the rest.

In our analysis, we attempt to explain the findings from the syntegration workshop by reflecting on the power of regulation when we move from a national to an international context. Our conclusion is that although at a national level regulation can be a powerful instrument for eGovernment and eCustoms implementation, the power of regulation fades to recommendations and soft law the more we move to an international level, and thus, making it a less powerful instrument. This paper can be seen as a contribution to the eGovernment literature, where we extend the existing research on the role of regulation for eGovernment innovation taking it from the national to an international level. This work can be of use for practitioners working in the area of eCustoms. Unlike the usual perceptions of individual experts that regulation is a powerful tool which can enable and inhibit eCustoms developments, in this paper we suggest that this may not necessarily be the case, especially when we move to the international arena. This may have strategic implications as well, as realizing the limited power legislation plays in the international arena, businesses and governments may need to explore other mechanisms that may turn more suitable in pursuit of their goals.

Acknowledgements

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Implementation Challenges: Competing Structures When New Public Management Meets eGovernment

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Abstract. This article discusses practices, opportunities and challenges in local eGovernment project management; the development towards eGovernment and "the 24/7 agency". Analyzing a case against eGovernment success factors we find seven "critical issues"; political timing, resource allocation, political mandate, distinction between administrative and political responsibilities, coordination of departments, dependence on providers, and use of standards. These are issues where development is open for local choice, influences of strong stakeholders, and chance. This situation is a consequence of the prevailing strategic model for the public sector, New Public Management. This model by design leaves these issues in a void which has to be filled by negotiations among many actors with different roles, goals, and action space. The general lesson is that the void needs to be filled strategically; to reduce the risk level and increase the ability to implement policy or it will be open for unexpected turns of events.

Keywords: eGovernment, New Public Management, Project Management, 24/7 Agency.

1 Introduction

Electronic Government (eGov) is typically defined as a positive development concerning three main actors; government administrations; users of government services, i.e. citizens and companies; and the political system due to "better democracy" typically meaning more openness [1] [2] [3] [4] [5] [6] [7]. eGov is employed to deliver a more efficient administration, better services and more openness. It is conventional wisdom that eGovernment benefits come from reorganization, not from ICT directly. Benefits have to come either by reduced production costs or better services, or both. While costs are comparably easy to measure, assessing benefits are much harder. Both the academic discussion and practitioner development efforts have recognized both financial and non-financial costs and benefits of many kinds, e.g. [8], and tried to devise useful measures, e.g. [9] [10]. In practice it has proven hard to implement such criteria in the incentives of individual government agencies, where the development is supposed to take place. Hence basic tangible economic measures so far prevail and grander plans for interoperability, better services to citizens, etc. come second. Also in terms of do ability eGovernment implementation is a challenge because of the complexity ofgovernment organization, the complexity of demands, and the lack of general standards to follow. But complexity is not

the only problem. While many governments are well managed in many respects, eGov systemic gains –reorganization – have everywhere been hard to realize. This paper looks at, but in particular beyond, the complexities to the structures for handling them, the government management model. In the industrialized world, this is today New Public Management (NPM). While heavily criticized, e.g. [11] [12], it is clearly the prevailing paradigm.

In government practice, Electronic Government was conceived under the NPM regime and has been seen as the perhaps most effective implementation tool. Could it be that many of the "complexities" in implementing eGov are not inherently insurmountable but rather become complicated precisely because of the management model? This article investigates this issue by means of a case study from an eGov development project at municipal level, where conflicts between the departmental approach of NPM and the universal standardization approach of eGov are most likely to clash. In city government two standardization principles clash. Cities accommodate many departments which are each governed by different national regulation – social service, social benefits, schools, communications, etc. In each of these sectors there is a conflict between within-sector standardization and across-sector standardization. Cross-sector standardization would make cities appear more unified to citizens and would rationalize city administration. But national government encourages national standardization by sector as that is beneficial for each sector. To further complicate the picture, the NPM model is based on department efficiency, which means national regulation such as standardization is hard to enforce. This means the clashes are not necessarily only between national and local political levels but between different organizations at different government levels, each driven by its business goals.

This paper illustrates and analyzes the complexity of achieving real change by a case study of a local eGovernment design and implementation project in a Swedish city. The research questions are**:** *How are eGov implementation projects managed at local government (city) level?* And *How are whole-system eGovernment success factors such as interoperability, standards, convergence incentives etc. handled in local development?* The purpose of the paper is both to illustrate the complexity and to point to issues where the governance model is unable to properly handle the challenges. This means the paper aims at opening a discussion about the relation between further eGov development and governance models in general, here using NPM as a vehicle.

The article is organized as follows. Following this Introduction, Section 2 briefly introduces New Public Management as a background for the case study. Section 3 provides another necessary background description of the Swedish public sector and gives an overview of the project studied. Section 4 discusses the method. Section 5 presents the empirical findings and highlights seven "challenges". Section 6 concludes by summarizing the findings and analyzing them in view of eGovernment goals and NPM tools.

2   NPM and eGovernment

The NPM was coined in academia in the early 1990s. By now most governments in developed countries have followed, more or less, at least in practice. NPM is seen as a managerial strategy based on theory of public choice which seeks to enhance the

efficiency of the public sector and the control that government has over it. The basic idea is that more market orientation in the public sector will lead to greater cost-efficiency for governments, without having negative side effects on other objectives and considerations that "old public management" – detailed regulation based on political goals – could achieve. The following seven elements (as summarized by [21]) are characteristic for NPM: (**1**) *Decentralized budget responsibility*, (**2**) *Internal (quasi) markets*, (**3**) *"Cost awareness", ongoing rationalization of operations to increase productivity*, (**4**) *Use of management methods and models from private sector*, (**5**) *Increased formal action space and more clear responsibilities for managers at different levels*, (**6**) *Efficiency is measured by explicit and measurable goals* and (**7**) *Focus on "customers" and results*. To be able to do this large bureaucracies are broken into business-like cost units so that the above measures can be effectively applied.

Clearly NPM has many critics, who typically point to the differences between the public and the private sectors and show that NPM tends to ignore these differences e.g. [13]. Academics have claimed that NPM has its best years behind e.g. [11], and that other forms of government are appearing. Such forms are claimed to have to do with emerging practices of governments networking, federalism, new active relations with citizens, etc., but also with issues that have been found lost in NPM such as politics, whole-system thinking, and person-centeredness (back to citizen rather than customer). "Digital Era Governance" is one candidate [12]. However, so far NPM remains the preferred management strategy in practice.

3   Swedish eGovernment and the Movit Project

Swedish government is organized in three tiers, national, regional and local, each politically governed. The Swedish public sector has a strict NPM management model, which means governance by budget and goals, not detailed regulation, also within cities and regional organizations.

eGovernment in Sweden, as in the industrialized world in general, is funded within the ordinary budgets. National plans are typically general and for guidance only, details and decisions are largely left to individual government agencies. The development so far has seen the large national government agencies such as Taxation, Social Insurance, Labour Market Information, and Student Loans applying e-service models to substantial economic benefit and considerable service improvement using web sites with information and automated services and call centres to replace staff. In municipalities the picture is different. Scale benefits are harder to find. Municipal organization is heavily departmentalized, borders drawn by different legal frameworks regulating different tasks, traditions, professional competence areas, and local competition for funds.

The general view is that municipalities are lagging, and there is a call for them to implement e-services [14]. This is for reasons of economy, modernity, demand, and management. eServices have shown to be efficient elsewhere, people tend to increasingly prefer e-services to traditional ones, and city managements want better tools for steering the organization and producing qualitative and measurable output.

3.1   The Movit Project

Örebro City has some 11000 employees and a population of over 130 000 [15]. In 2005, the MovIT project was set up to achieve coordination across the city, under direct control of the CEO (Chief Executive Officer). In the budget for 2007 it was explicitly stated that the focus for the City must be "*to improve the quality of life for the citizens*" [15]. To implement this political wish, the City needed to improve the services towards businesses and citizens, improve efficiency and become more easily accessible. The politicians wanted their citizens to see the City as a service provider and it should be clear what kind of services it provided. To accommodate this, the City launched MovIT that would focus on the external processes, directly affecting the citizens, and reorganize the internal supporting structures accordingly. There were five sub-projects in MovIT: Complaints management, eServices, Service Guarantee, Web structure and design, and Customer Service, each with a separate project manager and a project group. This set of projects would cover the problem situation well enough to get started; a few test services, policies for the purpose of focusing more directly on citizens, and reorganization to implement these policies and at the same time accommodate the envisioned gradual transition towards e-services.

4   Method

Data for this article was collected in early 2008, halfway into the MovIT project. Interviews were made with key actors in the project, and documents guiding the development in the City since the early 2000s were analyzed. Group interviews were conducted with the members of the steering committee, individual interviews with project managers and with representatives from the organizations that were affected by the changes. All documentation produced during the project, such as project directives and reports, political documents etc, was studied. Based on this information, the project history was described as a "case story" [4] by the first author. Then a case analysis based on NPM and eGovernment goals, tools and methods was done by the second author. Situations and issues that were particularly interesting for either posing obstacles or facilitating development were then investigated further by additional interviews and information searching. These problematic situations were analyzed in terms of their antecedents so as to provide understanding of the situations and processes in which decisions crucial to the future development are made. For validation the article was presented to the steering committee and the project managers to check accuracy of details and to get feedback on interpretations and conclusions.

   While the project is still underway and final outcomes not yet clear, this paper can already provide knowledge to achieve a better understanding of local development processes. While we do believe that the situations we found in Örebro are quite common, we do not claim that our findings are complete or universally applicable. Our contribution, beyond the case description and analysis, is to highlight critical issues about these development processes and to point to the great importance for eGovernment success that the governance model employed has.

5   Findings

The MovIT project was set up to implement a political initiative, and meeting deadlines was important. Politicians wanted results quickly, the subprojects should be finished and the eServices implemented and operational when the steering committee handed in the final project report in August 2008. As a result, all other criteria were designed to meet that critical limitation: "*We see time as "sacred" as it is a political decree which ultimately implies compromises either with cost or quality, and in our case it will be the quality that will suffer first. If we would abide by the quality demands, it would at least take a year to deliver a functioning eService.*" [16] The steering committee very clearly passed this on to the different subproject directives; the schedule of each project was not to be deviated from. Hence,

> **Challenge #1: Political directives often come with time limits. This is good in that it spurs action but it can also cause trouble as quality may be affected. In this case clearly political wish was given strong preference. Although we cannot yet see the final outcomes of this, it certainly has affected the project process.**

5.1   Financing and Resources

The project budget was only for new items such as producing the service guarantee. Design and implementation of eService, for example, was considered organizational improvements and hence to be covered by the departments' budgets. NPM adhering, the argument was that this would lead to departments becoming more effective. However if the eService implementation would require any additional cost due to usability and accessibility requirements imposed centrally departments could ask for financial support, subject to Steering Committee approval. Criteria for approval were not settled beforehand. Hence, resource allocation in practice came down to what the project management could persuade departments to provide. In total around 50 people were recruited to work with MovIT, each contributing 25 % - 100 % of their working time. Time allocation was done by informal arrangements which meant that each department had to bear the costs for staff working on MovIT and that this work was in conflict with their ordinary work. This conflict of interests led to negotiations between departments and MovIT management. While enough understanding was reached to keep the project running, this informal resource allocation was a constant trouble. For example, the steering committee had approved to cover some of the additional costs for technology, but as the joint procurement procedure (with other cities, to reduce costs) broke down and a new option had to be quickly found the steering committee backed down on their previous decision and central funding was used to cover the entire cost as it now was seen as a matter of internal improvements of an existing system.

> **Challenge #2. Resource allocation for joint development is a critical point in NPM. As resources are pre-allocated to individual departments, resources for projects have to be negotiated, even in a case like this when political directives are strong. The result of the negotiations depends on the individuals involved. It is basically the charm of the project manager – and of course any political pressure s/he is able to put on departments, e.g. using other policies as leverage – that makes the difference.**

5.2   Complaints Management

The complaints management project would deliver a general service policy and an access guarantee proposal by the end of 2007. It was also charged with the task of generating a common complaints procedure for the entire City.

Prior to MovIT Örebro City did not have a common complaints procedure so each department could handle complaints as they saw fit. This was seen as ineffective and therefore a common procedure was developed, complaints defined as "when a citizen shows signs of, or expresses, a dissatisfaction with the service delivery, the quality of the service provided, or the lack or unavailability of service" [17]. Adhering to this new procedure, every employee would know how to handle complaints and all complaints would be dealt with in the same way.

On top of the service policy there was the access guarantee. This stated that all citizens should be able to get in contact with every department, organization etc. during weekdays. A citizen should only need to call once to get in touch with any employee s/he is seeking or, the citizen should be contacted within two days of the initial contact, any decision or answer within five workdays. The access guarantee also stated that citizens always should experience that employees in the City are addressing their issue in a sympathetic, helpful, and efficient way. Furthermore, citizens should recognize that the City and its employees correct any mistakes made. Citizens should also be aware of the City's goals to improve all things that need to be improved.

The service policy has been in effect since January 1st 2008, the access guarantee will be in effect from September 1st 2008. The complaints procedure has been approved and the work on creating the routine and connecting it to the customer service will continue throughout 2008.

> *Challenge #3: These guarantees are critical instruments for convergence across city departments, both generally and in terms of forming a basis for developing standardized e-services. The guarantees are a direct result of political directives. Without such, important instruments like these will not be developed. It should not be forgotten that the enthusiasm behind MovIT stems from a change in power and implements a politically controversial view of the public sector as a service institution.*

The service guarantee sub-project was responsible for designing and implementing local service guarantees at departments throughout the City, all based on the common guarantee discussed above. These guarantees would state clearly what a citizen can require from the City when they utilize a particular service. "Development coaches" were educated in designing (local) service guarantees and would then each help one department with their guarantees. The basic content of a guarantee is the following: *Description of the service area*, *Explicitly stated guarantee*, Contact information *if the citizen wants to give feedback or complain*, *Description of what kind of service the city is offering in return in case of unsatisfactory delivery of service*, and *Explanation of how the citizen can acquire more information regarding the service area*.

The project group designed a total of 15 guarantees, four within the School sector, focusing on what citizens as parents and children can request regarding education, seven within the Social Welfare sector focusing on financial support and aid to elderly and disabled citizens, and four in the Civil Engineering sector regarding environment

and health protection, food control, building permits and water supply, snow removal and garbage disposal. These guarantees address many issues including delivery time, assistance availability, information availability etc. The 15 service guarantees were accepted and are undergoing an internal trial period between January and March 2008. The project group will continue to develop new guarantees in areas not yet addressed and make changes to the ones already designed.

Challenge 4: Good design of service guarantees, both bringing citizen added value and being administratively easy to handle, is critical for success. Clearly guarantees have to be both legal and meaningful, i.e. providing real value to citizens. Issues arise when, for example, "good education" cannot be guaranteed in terms of compensation. Is "information" and "availability" enough? This is where the distinction between politics and administration becomes clear. The administration can only guarantee access, anything to do with the quality of education beyond professionalism and legal actions are rather political issues.

5.3   eServices

Örebro had been working towards implementing eServices since 2002, when discussions on becoming a "24/7 agency" begun. At that time discussions involved mainly technical staff working on the possibilities of complying with the 24/7 agency guidelines. With no interest at strategic level in the city, progress was slow. MovIT set out to coordinate eServices; one important purpose was to prevent uncoordinated development of eServices at individual departments. Örebro also joined SAMBRUK, an organization involving many cities in establishing interoperable and shared technical solutions. At this point it became clear that designing city-wide formats for eServices required a more comprehensive analysis: *"…it turned out that we could not implement an eService without doing thorough analysis of our processes and organization because the added value to citizen could not only come from just providing the service online we needed to make our processes and organization more efficient."* [18] Such comprehensive analysis was not done centrally, but departments were invited to submit proposal for e-services and the IT Advisory Board (ITAB) developed criteria for assessment of proposals. While most proposals did not take issues like this into consideration, for fear of different departments developing separate and potentially non-interoperable solutions the ITAB had to accept proposals with a requirement clause: in order for the ITAB to add the service into the IT-plan – necessary for achieving central funding – the department had to arrange so the service provided would at least reach a minimum level with respect to the requirements set by the ITAB and MovIT; (1) be compatible with existing software, (2) comply with the current security standards; (3) improve the efficiency and effectiveness of the organization, provide added value to citizens, or both. The ITAB move towards becoming more welcoming to e-service proposals was designed to promote interoperability and convergence. By approving the proposals they would be able to prevent suppliers from circumventing the ITAB (and nowadays MovIT); the departments' heads would have to discuss any system accepted in the IT plan with the ITAB.

Challenge #5: Under the NPM model, individual departments are in charge of their budget. Any attempt at coordination must be more by carrot than by stick. Carrots include central funding, in this case the IT plan and MovIT. Sticks are legal regulation and bylaws, but these are typically not detailed enough to prevent issues like the ones here described, precisely because of the NPM model which is designed to encourage business thinking at department level and hence must provide departments real choices.

As the time schedule was tight, the steering committee wanted to speed up ongoing work with eServices rather than start new projects from scratch. Three eServices were selected to initially be implemented as MovIT projects; Child care service to parents, application forms for building permit and service to NGOs, mainly sports clubs, all of them already existing in the general IT-plan. Implementing the services turned out to be more problematic that initially perceived. Örebro is partner in SAMBRUK, a project involving over 30 municipalities in Sweden, the idea of which is to collaborate in developing eServices by sharing software, definitions and process models. The large number of cities within SAMBRUK and the lack of national and/or generally agreed standards make the procurement procedure a tedious endeavour. For both the Child care and the NGO service project this cooperation proved unsuccessful: "*the major suppliers were unwilling to open their systems for an external eService. This lead to postponement of the procurement and we had look for other solutions.*" [19]

New suppliers were brought in which led to unanticipated costs but at least brought the plan reasonably back on schedule. This subproject has not achieved all its goals. The building permit project is on hold pending results from evaluation of an external pilot involving five other cities regarding a common eService for building permits. The project for Child care service is hoping to solve the technical issues during 2008 so the eService can be launched even if later than planned. The NGO support project has launched an eService but to be able to improve it, more analysis is needed to find a solution for the locking and passage system. This work will continue during 2008.

Challenge #6: It is a long standing problem that cities are much in the hands of their suppliers. Suppliers do not necessarily want cities to join forces to get better deals. Cities are often reluctant to engage new providers as they often feel comfortable with the one they use, and handling many is generally more complicated.

5.4   Web Structure and Design

The project directive for the webs structure and design project required focus on a few specified target groups when designing the web structure and design for the city's web site. The City followed Verva's (the national e-Service authority) methodological advise which recommends prioritizing among target groups and acquiring in-depth knowledge of the chosen target groups so as to "be able to choose between functions and solutions for the overarching design of the website, to create a logical information structure and to create the correct graphic layout, and to realize the most benefits of the IT investment" [20]. Five target groups were selected as first priority. In-depth interviews with citizens' from these groups were then held based on which "personas", archetypical users, were designed. The personas chosen were Parents,

Entrepreneurs, Relative, Recreational, and Culture. Clearly this solution was partial – how about elderly, for example? Immigrants? While it is possible that the web design can be improved this way, it is clear that new demands will follow as supply and use increase. However, this method is just one out of many to decide web design. An alternative approach would be focusing on general usability for the purpose of making services' "look and feel" as similar as possible. One argument for such thinking is that over a lifetime most people will use all services, parents help children, children help parents and so they become assistant users for some other target group. Hence, the argument goes, it is easiest with a consistent and proven general design. For such design there are international guidelines. A third alternative would be focusing on clustering service supply according to "life situations". This approach groups services for "youth", "parents", "elderly" together so users not just find things they actually look for but also become aware of services relevant to them which they did not know about beforehand. Examples of this include many national web sites in e.g. Austria and Sweden. Whichever method chosen there is no single best solution. There are always trade-offs to be made.

Challenge 7: Standards are clearly useful as they facilitate design. As this story shows there are not only technical standards but also such that pertain to use and service organization. These standards are rather more best practices than unequivocal standards, but best practices often become so familiar among users that changing them is hard. In this case there was no complete service supply to organize, but in a few years there will be. Then there will be need for another revision of the web. Timing is important, On the one hand, imposing an abundance of standards to a web with yet very few services may be overkill. On the other hand, making too special designs – non-standard – may prove expensive at next revision as services may have developed in different directions design wise and may hence require considerable changes and costs.

6 Conclusion

This paper has reported an ongoing radical eGovernment case involving considerable reorganization and a clear, politically decided, citizen focus. Our findings have been pinpointed above as a number of challenges, critical because the choices made at these junctions may have profound effects on the outcomes. A common theme for them all is that in the lack of national plans local organizations are struggling to find development models that are both interoperable beyond the own organization and economical. We have shown above that this struggle involves both cumbersome partnerships and makeshift solutions.

Analyzing these issues in the perspective of the NPM model we find that many of the problems encountered have to do quite directly with this model. Table 1 summarizes the relation between NPM and eGov as expressed by the findings of this case study by plotting the seven challenges discussed here against the three overall eGovernment goals (More efficient administration; Better services to citizens; Transparency and improved democracy) and NPM tools for dealing with the challenges.

Table 1. Challenges of NPM and eGov

MovIT challenge	Reference eGovernment goal(s)	NPM features, tools and methods	eGov features, tools and methods
1. Political timing	More efficient administration; Better services to citizens; Transparency and improved democracy	NPM directly implements political goals to the extent they can be specified in terms of actions, i.e. by budget measures	Most infrastructural items, e.g. Enterprise Architectures, are designed to provide long-term stability and avoid direct, and hence potentially disrupting, political influence
2. Resource allocation	More efficient administration	Department budgets, service quality measures	Usually based on adherence to national plans regarding interoperability, process integration, standards, access, etc.
3. Political mandate	More efficient administration; Better services to citizens; Transparency and improved democracy	Given within department. Across departments based on business agreements.	Relies on national standards and guidelines making political mandate less important in details
4. Distinction between administrative and political responsibilities	More efficient administration; Better services to citizens; Transparency and improved democracy	Blurred. Politicians can at any time make changes that affect operations	Clear. eGov draws on standards and interoperability which makes direct political intervention hard and slow.
5. Coordination	More efficient administration	Coordination within departments centralized. Coordination across departments dependent on business agreements	Strong focus on standards and interoperability
6. Dependence on providers	More efficient administration	NPM makes scale advantages hard to achieve across departments; open to business agreements.	Scale advantages: National standards for software. National requirements for functionality. Enterprise architectures
7. Choosing among standards and best practices	More efficient administration. Better services to citizens and companies	Across departments based on business agreements.	Measures for service quality, interoperability, access, usability, etc.

As the table shows, NPM leaves many issues critical to eGov success open to political decisions. Somewhat surprisingly, given the basic idea, the NPM model blurs the distinction between political and administrative mandates by making interoperability issues dependent on many political decisions rather than one. For example, a national policy on interoperability would have reduced many of the problems encountered in this case because the integration would have been based on standards rather than a political wind change. This would have meant the long-term integration work would have had a constant mandate and every decision would be

considered in that perspective. In the Örebro case a sudden political wind change indeed spurred integration but as this was new, resource allocation and goals were made in a hurry to meet the political deadline, based on enthusiasm among managers and project leaders. This certainly made positive things happen, but what about next political wind change? Will the changes now somewhat makeshift implemented be strong enough to survive?

While it is methodologically incorrect to generalize from a single case, it is clear that these problems to a large extent are directly derived from the NPM governance model. Hence the case is illustrative also for other countries even if the details may be different depending on the exact implementation of NPM. The case shows that the economic model for governance, NPM, is conserving institutions rather than promoting change in several ways:

- It prevents development of national frameworks, such as enterprise architectures, which are necessary for the convergences processes that need to take place to make interaction across government organizations smoother. We saw in this case that such would have helped at several points, where now instead the City had to cook up local standards.
- It requires complicated cooperation's across both political and economic borders to not only implement shared services but also to finding economic advantages in procurement, service etc. This was clearly illustrated by the SAMBRUK debacle.
- It makes many technical problems involved with interoperability and standards more complicated by adding to them a dimension of politics involving many political directly coupled to specific – as opposed to economic interests.

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The Influence of Power in the Development of an Information Infrastructure

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Abstract. This study addresses the role of power in the development of an information infrastructure. It examines an information system which, once implemented, was institutionalized, expanded and integrated into a network of independent systems and services which originated an information infrastructure. It describes how powerful or empowered agents contributed to develop the analyzed, information infrastructure and put into practice the first attempt to introduce e-gov, in the Brazilian State of Sao Paulo. Its implementation was initially based on the government discourse on transparency and control of public finances. However, knowledgeable actors used it to change the role they played in their institutions. Power is examined using the circuits of power framework adapted by Silva and Backhouse [1] for the information systems area. Hanseth´s infrastructure theory is adopted to study development of the information infrastructure and is complemented by disclosing the role played by power in the development of this information infrastructure.

Keywords: information infrastructure, power, circuits of power, systems implementation.

1 Introduction

Information infrastructures (II) are essential to implement e-gov solutions, for enterprise activities and for society since an II is the result of a network of autonomous and heterogeneous systems and services brought together to implement new solutions. In spite of its importance, few studies have been devoted to this theme. Moreover, existing studies are controversial, adopting divergent views concerning II. Authors such as [2, 3, 4, 5, 6] have developed various studies focusing on II implemented in enterprises and therefore devoted to specific business strategies. In this environment of proprietary II, technological changes are decided by the management according to a well-defined plan. Thus their concept of infrastructures is unsuitable to study the II that emerge and are socially shaped by the influence and intervention of diverse independent actors. Moreover, since important decisions concerning development of proprietary organizational II, are made by a well-established and powerful board, the influence of marginal power is irrelevant.

Other research groups such as [7, 8, 9, 10, 11, 12, 13, 14] are dedicated to the study of II that develop over a period of time. According to [14] "installed informationsystems" that "have over time become integrated into a complex set of IT ensembles of highly

connected heterogeneous artefacts" are considered II, and therefore are also "complex, evolving and heterogeneous socio-technical systems".

Based on the presented concept of II, [14] formulated 'a kernel theory of how an II evolves and grows'. However, these authors pointed out that the theory is restricted to its current scope because "it does not say anything about the politics of infrastructure development" nor does it say how to "cope with power as a design constraint when one needs to align different interests". Therefore, in order to enhance and complement [14] kernel theory, this study addresses the influence of power for the development of an information infrastructure.

Studying the influence of power in the information systems area is a challenge for researchers, due to its "hidden and strategic nature" according to [15]. Moreover, power has been studied by various authors, taking into account different nuances. Certain authors such as [16] and [17] studied power as derived from positions of authority, i.e., formal power. Others studied the informal dimension of power considered by some authors to be illegitimate [18], political or even "the dark side of power" [19]. [20] identified various concepts of power in literature and classified them into categories. Among which, the most relevant for this study are: a) authority - power that is related to hierarchical authority and institutional power; b) decision rights or participation in decision making – power related to disciplinary power, sovereign power and power derived from control or ownership of resources; c) influence – focused on exercise of power in which one actor influences another's behaviour; d) politics – implying that power lies in strategies resultant from manipulation of information by some protagonists; e) interpretive –power based on the 'ability to control access to and direct the construction of organizational realities', i.e., 'power is defined in terms of the actors (individual or collective) ability to control and shape the dominant interpretation of organizational events. The resultant sensemaking is both the "product of mutually shared assumptions" and the "political dialogue through which actors influence the perceptions, decisions and behaviour of others". Therefore, as stated by [21] "power relations afforded by the social context emerge as a relevant concept".

Due to the various interpretations concerning power, Silva and Backhouse [1] proposed an adaptation of the Circuits of Power framework developed by [22] to study power in the IS field. The advantage of this framework lies in the integration of different concepts of formal and informal power.

In this case study, the power relations that emerged, enabled by the constitution of the SIAFEM II, were in part a consequence of the "fulfilment of personal agendas" which is considered by [15] and [20] as "politics".

Concerning the methodology adopted to study this type of power, i.e. politics, [15] argues that interpretivism is the most appropriate approach, since this power appears as an open interpretation of organizational rules.

The adapted [1] framework was considered a suitable theoretical approach to study the influence of power on the development of the II studied. That is why, the proposed research question for this study is: How can power contribute to the development of an Information Infrastructure?

The II under study, SIAFEM - Integrated System for State Financial Administration, was initially conceived as an accounting and cash flow system first implemented as part

of a broader e-gov program. Later, it became an II due to the expansion in scope and complexity sustained by powerful actors.

This paper has the following structure: in the next section contributions and restrictions on studies concerning information infrastructures are discussed. Then the discussion of the circuits of power framework is introduced. After the section describing the research methodology, the narrative and interpretation of the case is presented. Contributions and implications of the study are shown in the conclusion.

2 Literature Review

2.1 Infrastructures

Based on previous study by the authors, the proposed definition for infrastructures follows:

> *An infrastructure is a resource shared by organizations and people that make use of it for the development of their activities. It is the result of the integration of applications and technical artefacts, developers, software, computer and communications hardware, organizations and people. Therefore, it is subject to cultural and social influences, to establishment of patterns and technologies adopted for its creation and future expansion.*

This definition complements that of Hanseth for infrastructures as "a shared, evolving, heterogeneous installed base of IT capabilities based on open and standardized interfaces" and [7] view of management of an infrastructure as "going beyond the boundaries of centralized, hierarchical control of a resource", since it is 'a shared resource for a larger community rather than an organizational unit'. Furthermore, they claim that "it is developed and changed by several independent actors without any explicit coordination". Therefore, these definitions support the authors' claim that an II cannot be studied as an information system, i.e., something designed and completely controlled by a centralized management.

The reason for developing a study concerning II can be supported by the statement of the National Science Foundation (NSF), which developed various studies on information infrastructures, especially scientific information infrastructures (cyberinfrastructures). This is in accordance with a report resulting from the NSF workshop on "History and Theory of Infrastructure: Lessons for New Scientific Cyberinfrastructures" about various projects funded to develop a "highly reliable" and "widely accessible" infrastructure to "support the full range of scientific work". However, as stated in the report, to assemble such information infrastructure remains an elusive goal. The main difficulties pointed out are related to "planned vs. emergent change in complex systems" that evolve along time. Moreover, 'the boundaries between technical and social solutions are mobile, in both directions: the course between the technological and the social is not static, and there is not one correct mapping. Finally they conclude that a "robust cyberinfrastructure will develop only when social, organizational, and cultural issues are resolved in tandem…". Therefore, a robust theory on development of II is still incipient.

[14] offered a contribution to the study of information infrastructures (II) by proposing a design theory they called the "kernel theory", as summarized in Table 1.

Table 1. Principles for a design theory of II (adapted from [14])

Key strategy	Design principle	Element of Kernel Theory	Design Guideline
Bootstrap installed base	1. Design initially for usefulness even though the first users do not benefit from the number of users using the infrastructure.	Offer IT ability and support for the adopting community	1. Target a small group: 2. Make it useful without an installed base 3. Make it simple to use and implement
	2. Draw upon existing installed bases Utilizeexisting infrastructures as much as possible in the diffusion of the infrastructure.	Use larger installed base as your ally and increase positive network externalities across communities Avoid dependency on unavailable infrastructures	4. Use existing transport infrastructures 5. Design without the need for new support infrastructures 6. Use bandwagons
	3. Expand installed base by persuasive tactics to gain momentum Build an installed base as fast as possible.	Increase positive network externalities Create lock-ins for users Offer added value to users and expand learning in the user community to enhance IT capabilities	7. Enhancethe IT capability within the II only when needed 8. Build and align incentives accordingly 9. Develop support communities
Avoid technology lock-ins	4. Make it simple with each element in the II being as simple as possible	Build system that enables community to grow and learn from their experience	10. Make it as simple as possible
	5.Modularize by building separately key functions of each infrastructure, use layering and gateways	Account for unidentified needs Use means to separate concerns and simplify evolutionary decisions.	11. Divide infrastructure recursively into independent transportation, support and application infrastructures

2.2 Circuits of Power

As previously stated, the study of power is challenging due to its ambiguous nature. According to [15], to study power is to deal with the interpretation of meanings, intentions and actions to "unravel" its "hidden dimensions". [1] proposed a theoretical framework, adapted from Clegg's Circuits of Power [22], to analyze the relationship between power and IS. Because of the integration of different visions of power, this framework was considered a dominant tool to analyze the influence of power to develop the II under study. This framework comprises three circuits: the episodic circuit, the circuit of social integration and the circuit of system integration.

2.2.1   The Episodic Circuit of Power

According to this circuit, the master imposes something on the mastered. This circuit is composed of agencies, resources and outcomes. It comprises Dahl's definition of power: 'A' exercises power over 'B' when 'A' makes 'B' do something 'B' would not otherwise do. [23] conceptualizes this type of power as 'power over' or causal power. As stated by [15], 'this circuit represents the resistance that actors may present to the adoption of IS'. In other words, A creates for B an 'obligatory passage point' [24] exercising, therefore, 'power over' the mastered. [12], based on works by [24, 25], adopted the definition of an OPP as the result of a power relation between A and B. A will establish an OPP for B 'after which B has no other choice but to accept the OPP as created by A' [15].

2.2.2   The Circuit of Social Integration

This circuit emphasizes dispositional power. According to [1], the main elements of this power are the rules that govern meaning and membership in organizations. These rules can be formal or informal. For [26], dispositional power is a set of capacities. When exercised, these capacities cause something to happen. Therefore, this power becomes a causal power when it is exercised. Power lies in mutually agreed upon rules ingrained in the actions of members.

2.2.3   The Circuit of Systemic Integration

According to [1], power in this circuit can be understood in terms of its ability to produce and achieve collective goals. Indeed, it "comprises the material conditions of production, including those technological means for controlling the physical and social environment in organizations." This circuit tries to expose the techniques deployed by the master to monitor compliance by the mastered to established rules.

The Circuits of Power framework includes the notion of disciplinary power stated by Foucault, who made an important connection between power and knowledge, which are connected through discourse. 'Truth' is produced in discontinuous, unstable and mobile political discourse and is not universal, but is rather defined by each institution or society, which has its own "regime of truth". For [27] "truth is linked into a circular relation with systems of power which it induces and which extends it".

3   Methodology

This study was conducted as an exploratory interpretive case study research since it 'has the potential to produce deep insights into information system phenomena including the management of information systems' [28]. Moreover, an interpretivist approach would be suitable for 'unravelling manoeuvres made by actors in and around IS' or 'meanings that participants assign to them' [15, 29].

Research tools used in this study are historical documents (theses, books, newspapers and magazines) related to the case study, as well as government laws made at that time to implement the initial information system and the organizational changes required for implementation. Additionally, 27 semi-structured interviews with managers responsible for the implementation, users, the team responsible for the

system maintenance and the group responsible for providing support to its users were conducted by one of the authors of this study. Interviews were recorded, transcribed and interpreted by the authors. Remaining questions concerning interpretation of some responses were clarified by telephone with the interviewees. Due to the hidden nature of power, interpretation of the interviews was not shown to the interviewees as they would not entirely agree with our interpretation. Some insights concerning the government's intention when implementing the system were provided by one of the authors, who participated as a manager in the system implementation. Historical documents and interviews were analyzed from the theoretical perspective of hermeneutics.

The principle of the hermeneutic circle described by [28] was applied to this case study to build up an understanding of the phenomenon surveyed. According to [28] 'we come to understand a complex whole from the preconceptions about the meanings of its parts and their inter-relationships´. The understanding of the 'whole' was provided by historical documents, theses and newspapers available describing the governmental and organizational changes that took place at that time. The 'parts' resulted from the interpretation of each interview and provided details that improved the understanding of the 'whole'. Then, the study of the 'whole', again with the understanding of the 'parts', provided insights to interpret this phenomenon.

4   Case Study

The II under study was initially implemented as an information system. It changed to an II because of three centres of power which sustained its development: the Governor of the State, the State Department of Finance, and the State Planning Department. It could be considered an II when it began to grow independently in certain Departments by initiative of the employees or managers, i.e., without depending on central government coordination. It therefore assumed an emergent perspective, i.e., 'the uses and consequences of information technology emerge unpredictably from complex social interactions' [30, 31].

Development and sustenance of the II studied can be attributed to its emergent use as a surveillance tool by powerful actors and as an empowerment tool by knowledgeable actors. The dual process of institutionalization of the II and the de-institutionalization of old reigning practices engendered organizational and cultural changes triggered by employees' cognition and awareness related to new information available. SIAFEM II is presently available on the Internet to its 11.000 authorized users including its accounting managers. The transparency of public accounts to the public in general has been increased, since all governmental expenses are now freely available on the Internet, a resource intensively used by organized segments of the civil society. Moreover, SIAFEM II has an educational version that is distributed to accounting and business schools , thus increasing public awareness and use of the data for government accountability.

4.1   The Context of the System

Implementation of electronic government was initiated in Brazil by different levels of government in 1995, for the purpose of modernizing public administration, improving efficiency, effectiveness and transparency of public resource management. Modernization

and transparency were part of the new government agenda aimed at democratizing Brazil. However, an effective control of public finances, essential to implement e-gov, was only possible after 1994, when a well-succeeded plan for taming rampant inflation was implemented.

4.2   Analysis of Historical Documents

When the new Governor took office, in 1995, the State of Sao Paulo was almost bankrupt, and 2,000 developments were paralyzed for lack of resources. Outdated information related to financial data prevented government from planning expenses. Without a control instrument, it would be impossible to change this scenario and implement the idealized e-gov program.

The government initially chose SIAFEM, a system for budget and cash flow control, which had been developed by the federal government for States and Municipalities and had already been operating for more than two years in another medium-sized Brazilian city.

SIAFEM was imposed by law on all Departments and use became an obligatory passage point since the state's budget resources could only be accessed through the system.

4.3   Implementation of SIAFEM

4.3.1   Episodic Circuit of Power – Actions, Resources and Outcomes
The promoters of SIAFEM were the Governor and the Department of Finance. It was implemented in a record 45 days in all State Departments. Due to this short implementation time the majority of users considered the process chaotic. The insufficient number of microcomputers in Departments and the deficiencies of network connections were serious drawbacks. The computer illiteracy of civil servants, the huge resistance developed by some users in adopting the system and the initial system's instability also contributed to a troublesome implementation.

Resources for implementation were provided by a special international funding program, Promociaf, also complemented by government funds.

Since the Department of Finance was responsible for the State Treasury, it was easy to secure financial resources to build the essential network for implementation. This Department installed a Help Desk Centre for users. However, according to the interviewees, in the early stages it was very difficult to get any help since their telephone lines were constantly busy.

In the beginning, the number of microcomputers available in the Departments was insufficient. Therefore, the government had to expand the installed base to 5.000 microcomputers over a very short period of time, thus contributing to a self-reinforcement process.

Not all managers in the Department of Finance were favourable to SIAFEM implementation, since their power derived from bureaucratic duties, and implementation would be responsible for.disempowering them.

To implement SIAFEM, an organizational and cultural change was required, not only in the Department of Finance but also in all other Departments. SIAFEM became an obligatory passage point for all Departments. As such, Department members were

obliged to attend special training courses before system implementation because access to the Departments' budget was only possible through the system.

SIAFEM implementation triggered development of new systems by the Planning Department for auditing other departments´ expenses so that it could exercise power over other Departments. Some knowledgeable actors also started to build new systems to control their department expenses and control actions of other public servants, thereby increasing their power over other actors.

Frequent demands from the Governor for more control and constant concern with costs spurred the Department of Finance to build new systems: SIAFISICO and SIGEO. The first contains information on the prices paid for goods and services. SIGEO (Budget Execution Management Information System), which was based on SIAFISICO, allows aggregation of a number of databases to create a data warehouse for the State Government and to offer rapid access to managers of the State Managerial Units. The same system allows public access to information about government acquisitions via Internet, therefore providing, transparency of public accounts.

SIAFISICO and SIGEO were built after SIAFEM had become institutionalized, i.e., stabilized and legitimized by government bodies. The new systems were therefore built depending on the existing installed base. SIAFEM and SIAFISICO, made it possible to build BEC (an Electronic Procurement Exchange), which changed the relationship between the government and suppliers, enabling the state administration to pay fairer prices for purchased goods and services.

Each of the systems developed by the Planning Department and Department of Finance increased control over public expenses. Departments are now aware that they are under constant surveillance and are frequently audited by the Planning Department, Department of Finance and the State Court of Accounts. The dominant discourse used by the Governor to implement the system was transparency of public accounts, but the real purpose was control of public finances, according to the interpretation of one of the authors who played an active role as a manager during the process. At the Planning Department, SIAFEM became an infrastructure according to the criteria presented in 2.1, and was used as a base for the development of new autonomous systems.

When SIAFEM was first implemented, even managers of the Department of Finance were unaware of the power and control that the system could offer.

Upon SIAFEM's implementation, formal governmental planning became possible. Servants self-disciplined themselves as they became aware of the surveillance exercised over their actions by powerful or empowered actors.

Knowledge generated through available data was responsible for refining 'truth', allowing generation of new governmental discourses and new 'regimes of truth' based upon new knowledge of public expenses. As stated by Foucault, power relationships cannot be established or implemented without a discourse. Truth is produced by the action of power, but power cannot be exercised without the 'production of truth'. Truth is produced and perfected by knowledge that has the effect of empowering knowledgeable actors.

4.3.2 Circuit of Social Integration

Some Departments were capable of building systems based on SIAFEM and SIGEO and thus creating the SIAFEM infrastructure, obtaining positive network externalities from these newly built tools.

One of the findings from interviews is that although staff members in some Departments are interested in using SIGEO, their managers are not willing to acquire the necessary new software licenses. They want to retain control over information because this is the basis of power and, as SIGEO is an instrument of transparency, they are not in agreement with its use.

According to this case study, after attaining legitimacy, expansion of the SIAFEM continued, sustained by powerful interested actors (Department of Finance, Planning Department and the Governor) fostering development of new independent systems by these bodies. Certain knowledgeable departmental managers developed programs based on collection of data from SIAFEM and SIGEO to be used as an instrument for surveillance or empowerment, thus fulfilling their personal agendas based on the institutional discourse of transparency and control of public accounts.

SIAFEM brought about an organizational change in all State Departments and the building of an information infrastructure in some Departments. This infrastructure was not developed in Departments where the system was interpreted only as a tool, and where the importance of collecting the available information was not visualized.

4.3.3   Circuit of Systemic Integration

SIAFEM, which in its initial stages was just an instrument of control, soon became an instrument of surveillance. Features were refined over time with the infrastructure development imposing new discipline and production techniques. SIAFEM has disciplined all governmental acquisitions of goods and services and has triggered cultural and organizational changes in all Departments with the dismissal of employees and managers. Managers were empowered and disempowered and a new 'regime of truth' was imposed based on surveillance over servants' acts, and perfected by ever changing 'knowledge' about public expenses.

4.4   Analysis of the Development of the SIAFEM Infrastructure

SIAFEM II features varied over time, from a budget and cash flow control to a base for new systems such as BEC and various other autonomous systems developed by the Department of Planning and other Departments that were working with heterogeneous platforms, thereby adding new systems to SIAFEM II and increasing its complexity.

Development of the SIAFEM infrastructure was based on the existing installed base and was driven by powerful actors that invested resources in improving and maintaining its development. Actors that were empowered by the use of the infrastructure were also interested in perfecting the controlling features.

Support communities were built as the Department of Finance provided a training program and installed a Help Desk for users.

The system was expanded and gained 'momentum' when the government expanded use of the system to all governmental bodies thus confirming the design principle for bootstrapping an installed base.

SIAFEM II grew in certain Departments, reasserting an element of the kernel theory that a system has to be built to enable the community to grow and learn from experience. SIAFEM II also follows a design guideline establishing that the II has to be as simple as possible, which permitted development of systems based on it. By

implementation of the data mining and reporting system, SIGEO triggered a disruptive development in the SIAFEM infrastructure. The flexibility and possibility of extracting data from the system were responsible for development of various autonomous systems by end users and Department managers.

The Planning Department and the Department of Finance are autonomously planning new systems and hiring new tools without any central coordinator to drive the infrastructure expansion. However, no one is planning a technological update of the SIAFEM infrastructure. As times goes by, inflexibility has been increasing due to various autonomous systems built over it, without any coordination or standardization. This inflexibility will eventually have an impact on further expansion.

5   Concluding Remarks

SIAFEM II was built due to the influence of powerful and empowered actors based on 'political tactics' employed by them to 'construct the dominant interpretation of organizational events' [21]. Privileged perception about features that could enhance or perfect power has driven knowledgeable actors to dedicate efforts and resources to develop complementary and autonomous systems that contributed to the development of the SIAFEM II. Therefore, many of the current services available had never been part of the initial SIAFEM project, but were developed based on the perception of their emergent utility as a tool for the empowerment of their promoters.

New exercise of power was enacted through refinement of government discourse of transparency and better control of public finances. Information available by expansion of the II was added to existing knowledge, changing the 'regime of truth' that was based on available knowledge. Refined 'regimes of truth' were successively imposed on organizational actors enabling or constraining their courses of action. SIAFEM II triggered organizational and cultural changes in all Departments. Its growth, however, has been conditioned by the cultural and cognitive behaviour of civil servants. This confirms that development of II is subject to cultural and social influences and results from the integration of applications and technical artefacts, developers, software, computer and communications hardware, organizations and people.

Implementation of SIAFEM has been very important for the State of Sao Paulo because it has been the most visible electronic government project and has helped improve transparency of public accounts. The physical infrastructure set up to allow SIAFEM implementation, also became the embryo for a government communication network called Intragov.

The influence of power has played a fundamental role in the development and sustainability of SIAFEM II. It was converted into a tool for surveillance of the acts of Departments and their personnel. Thereby, the Government, the Planning and Finance Departments became powerful supporters of its growth and use. By means of its development, government 'regimes of truth' were continually shifted, creating space for new knowledge and consequently refinement of the effective 'regime of truth'. Knowledge, as conceived by [30], 'cannot exist except through relations of power' and power also triggers and produces new 'regimes of truth'. Power is also responsible for structuring a domain of knowledge and perfecting it through new knowledge. Therefore, the influence of power and 'refinement of truth' were responsible for triggering the development of the SIAFEM information infrastructure.

One should also not underestimate the impact on government actors' perception of accountability due to the increased transparency of government accounts now provided by the free public Internet access to SIAFEM expense and revenue accounts. This resource had been used intensively by the media and political actors for surveillance and analysis of government performance, an important factor in the consolidation and public legitimation of the system.

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Case Study on the Effects of Administrative Informatization on the Organizational Structure for the Central Government in Korea

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Abstract. The purpose of this study is to investigate the effects of administrative informatization on the organizational structure and manpower system at the eight selected central government bodies in the Korean government. In detail, since the Korean government took administrative informatization as a critical factor for government innovation in 1980s, it has also reshaped the governmental structure and manpower system in accordance with administrative informatization. Thus, finding out how administrative informatization influences the total number of public officials and the organizational structure of the government in horizontal and vertical is very important for setting the future direction of administrative informatization up.

Keywords: Administrative Informatization, e-government, organizational structure, manpower system, differentiation, Complexity, Centralization, Formalization.

1 Introduction

1.1 Background

Since 1980s, ICT has influenced and changed every aspect of our society such as politics, economics, and culture [9]. Especially, communication technologies got more diversified and generalized, and the distribution sysetm of information has become more open and more individualized for general citizens. In the past, it was almost impossible for general citizens to access highly valuable information because this kind of valuable information was distributed and kept only by the privileged. However, after the emergence and light-speed advancement of ICT, it started hand over to the public through manifold communication technologies. Thereby, the speed and scope of diffusion of information got extremely faster and wider so that the public can benefit from it. Ultimately, it played a pivotal role to accelerate the speed of social changes.

The public's Needs started changing and increasing rapidly due to the flooding of information they never had before. A good example revealing a cross section of this phenomenon is the market. The marketing method under which companies produced products in their own favors and forced customers to buy the products was no longer

accepted to customers. Customers enabled to collect useful information about the products they wanted to get by using the Internet and compare the products to other products based on the collected information. Today, it is not an option but becomes mandatory for companies to understand the needs of customers changing at any time faster and to produce cheaper but better products than those of opponents for their survival. It means that the core of the market now moves from producer-centric to customer-centric.

The advancement of ICT not only changed the private sector, but it also triggered to change the public sector. Citizens actively asked the government to open more information and improve transparency. Furthermore, they requested the government to build a system that guaranteed participation of citizens in policy making processes. ICT is one of the most important factors to change the administrative paradigm from government-oriented to citizen-centered.

In order to meet new demands of citizens effectively and efficiently countries began to make various efforts on grafting administration with ICT (An Empirical Analysis on Success Factor in Information Policy, NCA, 2003). Especially, Since 1990s, advanced countries such as the U.S., the Great Britain, and Australia seriously adopted e-government as a core strategy for improving government innovation and national competitiveness (e-Government Annual Report, Ministry of Government Administration & Home Affairs, 2006). Also, some of internationally recognized futurologists foresighted the advent of information society caused by the convergence of computers and communications from 1980s. The Korean government also realized the importance of ICT for the country's future and started promoting ICT industries and applying ICT into the government in earnest from 1990s (History of Korea's Information and Communication for 20 Century, Ministry of Information and Communication, 2006). As the result of enormous efforts that the Korean government made on establishing e-government services from 1990s, the Korea's e-government services were recognized one of the best e-government services in the world. For instance, the UN e-Government Readiness Index ranked the Korea's e-government services 5th in the globe following the U.S., Great Britain, and Sweden, respectively (UN e-Government Survey, UNDESA, 2005).

Korea seemed to enjoy a great success in e-government externally, but it encountered several difficulties internally. First of all, the utilization rate of e-government services is relatively lower than the level of the services. Even though the government established one of the best e-government services by investing tremendous amount of budget and time [8], the utilization rate of the current services is 47%(E-Government Performance Report, Ministry of Government Administration & Home Affairs, 2007) far below than 60% of the initial goal (e-Government Roadmap, Presidential Committee on Government Innovation & Decentralization, 2003).

Second, there is no solid ground by which all the e-government projects are orderly managed and objectively evaluated according to the performance of each project. Carr (2002) insisted that 60% of e-government projects in the U.S. expected to fail to achieve the initial goals. That Daws et al. (2003) pointed out a serious waste of time and budget in e-government projects.

Third, because there was a conflict of interests among government organizations, the fundamental and essential e-government projects such as ITA (Information

Technology Architecture) could not be launched at the first priority resulting in still existence of redundancy and duplication.

However, the biggest problem Korea now faces is the lack of deep research in the area of administrative informatization that embraces e-government as well. If a firm and practical model for administrative informatization and diverse citizen-oriented services were developed from the academic world, the Korean government would be able to dissolve many of trial and error as well as a lot of confusion in the process of policy making and executing.

Of course, there were studies about administrative informatization previously done, but most of these studies focused on conceptualization of administrative informatization, comprehension of policy and technology trend, and introduction of best practices missing the intrinsic studies of administrative informatization such as performance evaluation and effectiveness of administrative informatization [8].

Especially, Korea's e-government was begun not only to improve the quickness and effectiveness of administrative business processing, but also to innovate the government working methods and change administrative culture from government-centric to citizen-centric. Thus, the studies finding out the roots of existing problems and show the future direction are really needed and helpful to the government. To do this kind of research, the academic needs to focus on empirical studies instead of literature based studies.

1.2 Objective

The aim of this study is to analyze how administrative informatization affected the organizational structure and manpower system in the government. First of all, the organizational structure of the government will be classified into the horizontal and vertical levels, and then the core factors deciding verticality and horizontality of the structures will be identified to find out how the organizational structure is affected.

Secondly, if administrative informatization affects the organizational structure of the government, it probably affects government officials too. Thus, the organizational structure will be divided into three sub-levels: the top management level, the middle management level, and regular officials. Thereafter, each level will carefully be analyzed of any changes in the number of officials and personnel organization.

2 Methodology

In order to find out the effects of administrative informatization on the governmental structure and manpower system, this study went through 4 steps for the analysis. In the first step, previous studies, governmental reports, and relative web sites were carefully analyzed. In the second step, based on the materials collected from the first step we selected factors that affected administrative informatization and governmental structure and manpower system the most. At the same time, we made a guideline to select the target ministries for analysis. Based on this guideline, we selected 8 ministries. The selection of the target ministries was made in accordance with the scale of manpower, the level of informatization, and the duration of the ministry.

Table 1. The Selected Ministries

Number	Ministry
1	Ministry of Education and Human Resources Development
2	Ministry of Information & Communication
3	Ministry of Science & Technology
4	Ministry of Unification
5	Ministry of Justice
6	Ministry of Commerce, Industry and Energy
7	Ministry of Culture & Tourism
8	Ministry of Finance & Economy

For the first time, we just considered the size of manpower and the level of informatization as the standards for selecting the target ministries and then selected 10 ministries. However, we found out that the duration of a mninistry was very critical since several ministries had been amalgamated. If a ministry was amalgamated with another ministry before 1982, it was almost impossible for us to analyze the effects of administrative informatization for a ministry because there would be so many other factors that affected the size of manpower and the organizational structure. The reason we chose the year of 1982 as the starting point of our study was that administrative informatization in Korea really started from 1980s [6]. After we applied these standards to all the ministries, 8 ministries were selected as the target ministries for analysis.

Table 2. The Guideline for Selected the Targeted Ministries

Number	Standard
1	Scale of manpower
2	Level of informatization
3	Duration of the ministry

In the third step, we analyzed the horizontal and vertical differentiation, the change on the number of government officials and manpower system for the selected ministries. For doing this, we requested all the related materials to the government through the Korea Public Information Disclosure System (http://www.open.go.kr), but we could not get enough materials from the government. The main reason was that a lot of materials we requested were not digitalized yet. It still existed in paper format. Therefore, we visited the selected ministries to get more materials for our analysis.

Such collected materials were analyzed factor by factor to figure out the effects of administrative informatization on the governmental structure and manpower system. The changes in horizontal differentiation, vertical differentiation, manpower size, and manpower structure were investigated in five year intervals as follows: 1982, 1987, 1990, 2002, and 2007 except 1987 and 1990. As mentioned above, formalization is the degree of job codification, and the government had the most clear and detailed job codification in both public and private sectors. It meant that there would be not much of changes in formalization regardless of any kind of external effects. Therefore, we did not investigate formalization in this study.

Complexity could be divided into the horizontal, vertical, and areal differentiations, and we analyzed the total number of the lowermost sub-organizations in the selected ministries for the horizontal differentiation and the number of levels for the vertical differentiation as well. Since most of the selected ministries were located at the same building, the government complex, we excluded the areal differentiation. We analyzed the proportion of the top management group, the middle management group, and regular officials to see how administrative informatization affected the governmental structure. In the fourth step, we concluded from the each result of analysis with a short prospect for the future direction, and we also mentioned the limitation of this study.

As Table 3 shows, 4 critical factors were extracted from the previous literature review.

Table 3. Analytical Factors

Factor	Contents
Horizontal Differentiation	Analyze increase or decrease of the number of the lowermost sub-organizations as administrative informatization is enhanceed
Vertical Differentiation	Analyze increase or decrease of the number of the levels in the governmental structure of the selected ministries as administrative informatization advances
Manpower Size	Analyze the size of manpower in the selected ministries as administrative informatization advances
Manpower Structure	Analyze the variation of the size of the middle management group and the regular official group

3 Results

3.1 Changes in the Horizontal Differentiation

The quantitative fluctuations at the lowermost sub-organization level in the governmental structure were analyzed to examine changes in the horizontal differentiation. The examined results of all the target ministries were listed in Table 4 and Fig. 1.

Table 4. Number of Lowermost Sub-organizations in 8 Ministries

	1982	1987	1990	2002	2007
MOE	23	25	25	20	32
MIC	18	18	18	21	36
MOST	17	6	22	22	31
MOU	3	3	3	13	30
MOJ	21	23	21	25	30
MAF	37	39	40	37	28
MCT	14	18	18	28	38
MOFE	28	35	35	39	53

As Table 4 and Fig.1 show, the number of the lowermost sub-organizations in 8 ministries has been increased gradually for the last 20 years. However, there is an interesting finding from the results. While the number of the lowermost sub-organizations in 8 ministries stayed still from 1982 to 1990, it has been increased sharply from 1990 except the Ministry of Commerce, Industry and Energy. The year of 1990 is a notable year for Korea's administrative informatization because it is the starting point of Korea's administrative informatization in earnest. Therefore, we can say that the increasing point of the lowermost sub-organizations perfectly matches with the starting point of administrative informatization in earnest.
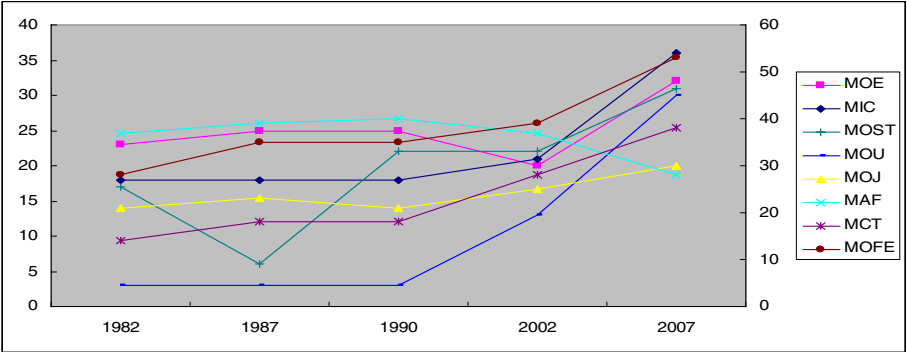
Fig. 1. Graph of the Number of the Lowermost Sub-organizations in 8 Ministries

3.2   Changes in the Vertical Differentiation

To begin with, we collected the organizational structures of 1982, 1987, 1990, 2002, and 2007 for 8 ministries and then analyzed the changes in the total number of the levels in the ministries. Table 5 and Fig. 2 indicate the results from the analysis of the organizational structures.
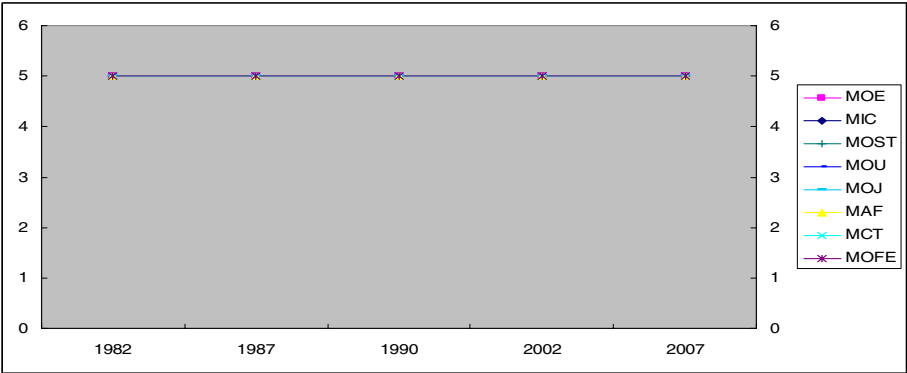
Fig. 2. Graph of the Number of the Levels in 8 Ministries

Table 5. Number of the Lowermost Sub-organizations in 8 Ministries

	1982	1987	1990	2002	2007
MOE	5	5	5	5	5
MIC	5	5	5	5	5
MOST	5	5	5	5	5
MOU	5	5	5	5	5
MOJ	5	5	5	5	5
MAF	5	5	5	5	5
MCT	5	5	5	5	5
MOFE	5	5	5	5	5

The results in Table 5 and Fig. 2 can be summarized as follows. The total number of the levels in the ministries has never been changed. It consisted of 5 levels in 1982 and still remains as 5 levels in 2007. In other words, even though administrative informatization advanced very fast for the last 20 years, the vertical differentiation in the organizational structures in the ministries did not occur at all.

In 1982, the vertical structure in the ministries was composed of 5 levels: Minister, Vice Minister, Director of a Bureau, Team Manager, and Officials, and it was exactly same as that of 2007. In conclusion, our expectation that the vertical differentiation would occur as administrative informatization progressed did not occur.

3.3 Changes in the Manpower Size

To study the relationship between administrative informatization and the size of manpower in the ministries, we analyzed the variations in the total number of the officials in the ministries in 1982, 1987, 1990, 2002, and 2007. Table 6 and Fig. 3 show the results.

As Table 6 and Fig. 3 indicate above, the results are very similar to these of the horizontal differentiation. From 1982 to 1990 there was not much of change in the
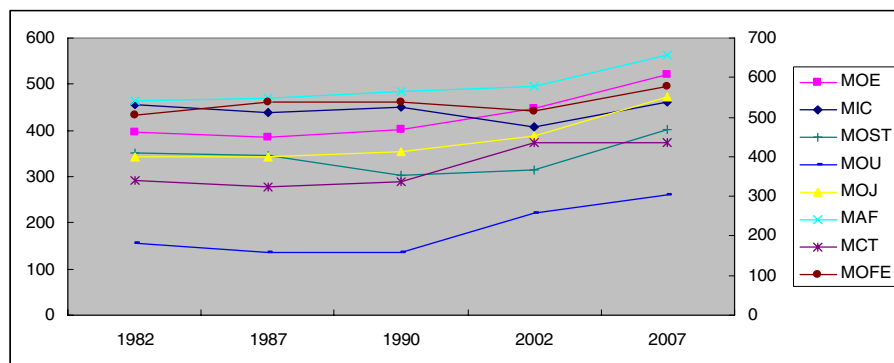
Fig. 3. Graph of the Total Number of the Officials in 8 Ministries

Table 6. Number of the Total Officials in 8 Ministries

	1982	1987	1990	2002	2007
MOE	397	386	401	447	522
MIC	455	440	451	408	461
MOST	351	345	304	315	402
MOU	157	137	137	222	259
MOJ	400	398	413	453	551
MAF	541	548	565	577	656
MCT	340	325	337	435	437
MOFE	505	539	539	514	579

total number of the officials. However, it started increasing gradually from 1990, the starting point of administrative informatization in earnest in Korea.

Such results opposed that administrative informatization vitalized communications between the top management group and the regular officials resulting in the reduction of the middle management group asserted by Malone et al. or it reduced the size and cost of the organizations with still maintaining the government productivity same as before asserted by Um et al., but there is a thread of connection between the obtained results and Lutz's assertion that the overall number of the middle management group would increase as administrative informatization developed. Lutz insisted that administrative informatization would produce enormous amount of digitalized information so that the government needs to hire more middle management group because most of government information is handled and used by the middle management group.

3.4 Changes in the Manpower Structure

We analyzed the percentages of the top management group, middle management group, and regular official group in 1982, 1987, 1990, 2002, and 2007 for 8 ministries. After the analysis, we realized that the percentage of the top management group stayed almost unchanged from 1982 to 2007, and the main focus was not to figure out the changes of the top management group, but the changes of the middle management group and regular official group. Therefore, the analyzed results for the top management group were not included in this paper.

To improve the accuracy and reliability of the analysis we calculated the percentages of the middle management group and regular official group instead of just calculating the number of the officials in each group. Table 7 and Fig. 4 describe the analyzed results.

According to Table 7 and Fig. 4, the percentages of the middle management group increased overall. In detail, as administrative informatization advanced, the number of the middle managers continuously increased. Moreover, it sharply increased from 1990 similar to the previous analyzed results.

Table 7. Percentages of the Middle Management Group in 8 Ministries

	1982	1987	1990	2002	2007
MOE	8.3	8.8	8.7	13.2	12.5
MIC	5.5	5.7	6	14.2	13.9
MOST	7.4	8.4	20.4	20	18.4
MOU	16	18.2	18.2	18.5	19.3
MOJ	4.5	5	4.8	9.3	10.5
MAF	8.7	9.3	9.2	19.4	18.1
MCT	11.5	10.5	10.7	16.1	16.5
MOFE	7.3	8	8	20.8	20.4
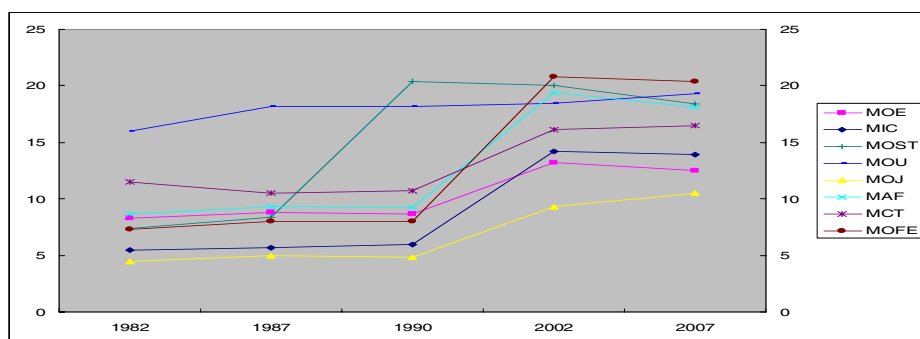
Fig. 4. Graph of the Percentages of the Middle Management Group in 8 Ministries

Now, let's see how the percentages of the regular official group changed. To analyze it, we followed the same method we used to calculate the percentages of the middle management group. The results appear in Table 8 and Fig. 5 below.

Table 8. Percentages of the Regular Official Group in 8 Ministries

	1982	1987	1990	2002	2007
MOE	69	65	64.8	61.5	57.7
MIC	75.2	70.7	70.3	56.6	52.9
MOST	65.5	59.1	52	49.2	41
MOU	51.6	44.5	44.5	46.4	44.4
MOJ	80	75.6	75.8	73.5	65.1
MAF	61	57.1	49.1	50.3	45.6
MCT	70	66.2	65.9	59	52.2
MOFE	62.2	57.3	57.3	48.4	45.1

As Table 8 and Fig. 5 clearly indicate, the percentages of the regular official group in most of the ministries were decreased. The reason is that most of tasks that were performed by lower level officials are now automated so that the government needs fewer lower level officials.
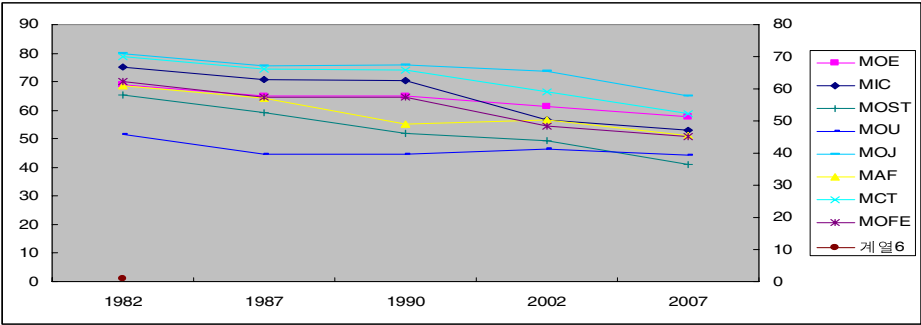
Fig. 5. Graph of the Percentages of the Regular Official Group in 8 Ministries

4   Conclusion

In this paper, we tried to investigate more on the actual effects of administrative informatization rather than examining facial phenomenon of it. A vast volume of the actual governmental data were collected through diverse channels and then carefully reviewed. Therefore, it would be a very useful reference to policy makers and decision makers in the government. Furthermore, it can help policy makers break down the reason why the initial goals of certain projects were failed to achieve and where they have to focus on in the future.

There are a few limitations in this study though. First of all, we did not consider formalization even though it is one of the most important factors to analyze the effects of administrative informatization. The main reason was that all the tasks in the government were formally and fully defined yet. There was almost no room for change in formalization. Thus, it is reasonable for us not to analyze the changes in formalization.

Secondly, due to the time limitation and shortage of relative data, we could not analyze centralization, one of the important factors needed to analyze for the effects of administrative informatization. Centralization indicates where the decision making power locates. Accordingly, additional studies are needed to replenish this area. The biggest challenge we face was that it was extremely hard for us to collect relative materials from the government because the government usually keeps its' materials for 3 ~ 5 years and then discards them if not neccesary.

Thirdly, we did not analyze all the ministries in the Korean government. It means that we can not apply our results to the rest of the ministries. However, we recognized this limitation at the beginning and decided to have a guideline for selecting the target ministries to reduce the gap.

Lastly, we would like to see a paper that can explain why our results occur in further studies. For example, it will be very helpful for us to find out the causes if in-depth interviews with officials in the front line are performed for each factor. In addition, it is very important to develop a model to explain the relationship between administrative informatization and the governmental structure so that other countries can benchmark it.

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Control, De-politicization and the eState

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Abstract. Using an extensive case analysis of the Bhoomi system of
India, this paper examines the role and nature of the state with regards
to the rationale for and deployment of e-government systems. Issues such
as the nature of control in governance, the discourse of de-politicization
in justifying e-government and the reinvention of the state via electronic
means are examined. Analysis of data collected over several years shows
that e-government systems are primarily used to centralize control in
the hands of the upper echelons of the bureaucracy, a strong discourse
of technology and 'high modernism' permeates the justification for de-
ploying e-government and this effectively de-politicizes the intent and
purpose of the project. The paper concludes that through e-government
the state reinvents itself, as the e-State, as a powerful, centralized force
that disrupts historical practices and relations.

1 Introduction

E-government literature, both popular and academic, broadly views e-government
systems as being beneficial for bringing about transparency and efficiency in
governance [1]. The extensive literature on this subject does not dwell, though, on
the nature of control, the discourse of de-politicization surrounding e-government
interventions, and the processes by which the State[1] re-invents itself through
e-government. This paper examines these issues at some depth.

Developing countries, in particular, have adopted e-government extensively
and have sought developmental benefits, along with improved governance. Devel-
opment in this context is understood as the process of advancing the neo-liberal,
market reforms-driven agenda that many developing countries have adopted [2].
E-government, implicitly and explicitly, supports the role of enhancing markets
and customer participation in them, and reduces the role of the state in markets
by improving processes of market access and government regulatory interven-
tions. The attempt by various governments is to hasten the process of develop-
ment by 'leap-frogging' the tedious tribulations of transitioning that developed
countries have undergone.

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[1] The capitalized "State" is the political idea of the nation-state, henceforth referred to
simply as the 'state.' Regional states, political sub-divisions, are referred to by name,
where possible.

In this context, this paper asks the following questions: Do e-government systems serve to increase or reduce control of the state in governance processes? Is there a discourse of de-politicization that the government resorts to in justifying and implementing e-government? How does the state re-invent itself through e-government?

This paper proceeds by first explaining the relevance of the above questions and their theoretical basis. This is followed by a discussion of a particular e-government project in India, which forms the basis for a case study that is used for a detailed analysis. The concluding section summarizes and inter-relates the findings from the analysis.

2   Background Theory and Methodology

In theorizing about the state it is important to acknowledge that in the modern nation-state the government is embodied by two sets of stakeholders, the politicians and the bureaucrats. These stakeholders inhabit institutions that constitute the state. In the body of literature that deals with e-government, the state is usually, implicitly, represented by the bureaucrats. (Where political institutions or persons are involved, the research is often termed 'e-democracy.') It is important to note this distinction as bureaucrats and politicians, as stakeholders, often have differing visions for the agenda for the state, some of which could be conflicting. Even within the bureaucracy the goals and agendas of different players, at various levels of the hierarchy are different.

The implicit view of the state in most e-government research is that it is liberal in its intent [2], in the Lockean sense, to protect citizens and their property, and enforce laws. This intent is then assumed for the representatives of the state, the politicians and bureaucrats. E-government is seen as a natural extension of this intent, and its role appears to be obvious, at times implicitly assumed. Conflicts and differences in the role of the state, and consequently of e-government systems, arise then from the differing views on how the liberal state can be exercised, not in its intent.

A widely different view of the state, an anarchic one, is also propounded by some [3]. [There is a vast literature on the theory of the state, starting with Plato and Aristotle, and built up by philosophers such as Hobbes, Rousseau, Ricardo, Hegel, Marx and others; however, to conserve space, we restrict our review.] Here the state is seen to extract material wealth from the natural resources available, extract labor from its citizens and force them to become soldiers to fight its wars. The state then exists only to exploit materials, labor and soldiers, and enforces laws to protect its continued supply of these. This view of the state originates from studies of monarchies and feudal states (and modern-day dictators), as well as colonial powers. The modern liberal states have inherited the structures and institutions that were built with this purpose in mind, and have continued to persist with them.

It is useful to keep these differing, and widely contrasting, perspectives on the nature of the state in mind while we examine the role of the bureaucracy. For this paper we restrict our attention to the bureaucratic structure in India.

2.1   The Bureaucracy

In India, the bureaucracy as a whole is represented by a strong hierarchy that peaks at the center, and has a base at the village level. The current Indian bureaucratic structure was evolved by the British for their colonial administration. After India's independence, in 1947, the elected government retained the old structure, while changing the name of the apex organization from the Indian Civil Service to the Indian Administrative Service (IAS). In the early years of Indian democracy a single party, the Congress party, was dominant in both the center and the various states and held the reins of the executive tightly. The bureaucracy retained its image of professionalism and of being a non-partisan entity. The central government dominated planning and development issues and the bureaucracy participated in the broad consensus on national goals. But after this era, a single party was unable to retain its strong hold on the national polity. The powerful parties that emerged began to rely on the bureaucracy for their executive and partisan agendas. Using destabilizing and demoralizing means, such as "favoritism in promotions, penalizing transfers, vitiation of normal procedures and operations through corruption" ([4]; also see [5], page 92), the legislatures in the states as well as the center eroded the non-partisan nature of the bureaucracy.

With an elected leadership that was increasingly incompetent at delivering the executive function, politicians began to rely more and more on bureaucrats who were sympathetic to their party ideology. These willing accomplices soon became the most powerful elite within the country.

Despite the erosion of professional values and the deep internalization of corruption, the service still managed to attract some of the best talent in the country and the bureaucracy "remains a reasonably effective instrument"[4], particularly, when compared to other South Asian nations.

The situation with officials hired within the states is somewhat different. There is a cadre that is selected on the basis of a merit policy, and this forms the higher bureaucracy in the state. The lower ranking and field level officials are recruited on the basis of verifiable qualifications and family affiliations. In the latter case, as is true for many village accountants, father-to-son transfer of positions is acceptable. Appointments can be made on 'sympathetic' grounds too, where senior bureaucrats and elected representatives hire officials who belong to underprivileged or under-represented groups.

Within the states, the power held by the centrally appointed bureaucrats exceeds those appointed by the state. The cadres of the central services also enjoy relatively better privileges as compared to their regional counterparts.

A characteristic of the central bureaucracy, as noted by some researchers [6], is that there isn't much cooperation between the various departments of the central government. The departments tend to operate in 'silos' and take their own decisions on projects. This pattern is changed only when there is a directive from the highest political authorities.

2.2   De-politicization

The idea of de-politicization explains the attempt by the state to portray certain development projects as being of a technical or economic nature, and not of a political nature. The state attempts to isolate the discourse, the discussions justifying or contesting the idea, around technical or economic matters in order to avoid the difficulties that may be inherent in political choices. Development theory has explored the idea of de-politicization extensively.

De-politicization does not imply that the state has reduced its role or that it has given up its political agenda. De-politicization has to be seen as a discourse that the state propounds, in part to hide its political agenda. While discussing a development project in Lesotho, Ferguson states:"For while we have seen that "development" projects in Lesotho may end up working to expand the power of the state, and while they claim to address the problems of poverty and deprivation, in neither guise does the "development" industry allow its role to be formulated as a political one" [7].

The 'development industry' referred to by Ferguson comprises of the government, the bureaucracy and multi-lateral funding agencies that eschew any political terms or intentions in their discourse in implementing development projects, but rely on technical and economic terms to justify and explain their actions. Although the agenda of the political party in power, in Lesotho at that time, was to explicitly impress itself upon the region, as became evident later, it hid this objective in the language of technical development. The project had no impact on reducing poverty or changing the agricultural practices of the targets of the Thaba-Tseka project, and it was considered to be a failure by the planners, but the 'instrument-effects' or unplanned consequences were such as to allow the reigning political party to establish a strong political and military presence in the region.

Scott uses the phrase 'high modernism' to refer to the beliefs of scientific and technical progress that inform the state. The state is then motivated to transform social order and redeploy economic resources based on a linear, technical rationale. The high modernist state prescribes an ordering of all human activity along principles of science and technology (Scott, 1998; pages 89-90). Further, this ideology is accepted and operationalized by the bureaucracy and intelligentsia, including planners, engineers and technicians. Scott shows that this discourse informs town and city planning, where geometrically intricate plans for cities are drawn up without regard for the multiple, organic, and negotiated ways in which cities evolve. High modernism thus de-politicizes; it removes from the realm of discourse the diverse and complex ways in which actual public projects evolve. It uses the post hoc *description* of the evolution of public spaces and projects, and then uses them as prescriptions.

The history of development, as planned interventions in poor and third-world nations, is rife with technical and economic projects that failed. Following the massive capital inflows into European countries after the second world war, the idea and discourse of development assumed currency in academic and policy circles of wealthy nations such as the United States of America [8]. Massive

investments were made, via the multilateral funding agencies, into various third-world projects targeting problems of poverty, low agricultural yields, destruction of the environment, and empowerment of women. Each of these initiatives directly avoided any consideration of political issues. Even when it was evident that the underlying causes of failure were a lack of political motivation and participation by the targeted populations, the funding and policy agencies continued with their flawed models and repeated the failures, shifting their targets in each iteration.

De-politicization acts to downplay political action, organizing and struggle of any sort. Effects of such practices, when they have an impact, are explained away as 'social capital' and civil participation rather than as direct and confrontational politics [9].

In the Indian context de-politicization is traced back to the actions of the British colonial powers who, during the peasant participation in civil disobedience campaigns in the 1930s, kept 'a close watch on the rural areas' and 'prompt action was taken whenever there was any danger of peasant unrest being linked with civil disobedience,' [10] (as quoted in [11]). The real threat to the British was not civil disobedience or peasant rebellion per se, but an articulation by the nationalists of the economic injustices to the peasants with the political movement of seeking independence. The British made similar moves in urban areas also, ensuring the economic grievances by workers was in no way linked with governance or political practices (where the British could then argue that governance was fine and well, and the problems were simply economic issues).

In a similar vein, when in independent India many groups started political action to demand land reform and address the concerns of the poor, the government in many cases responded by setting up an administrative framework for 'development' via credit relief, free schooling, mid-day meals etc. The attempt was to dissociate political and economic discourses.

2.3 Methodology

The data for this research is based on an extensive case study of the Bhoomi project in India (and relies on the case study method of analysis [12]). The data was collected via structured and unstructured interviews over two phases. The data used for the first phase of the study included interviews of the Project Champion, survey of users, interviews of Bhoomi kiosk operators, of administration officers, of high-level district officers who had helped with the implementation of Bhoomi, and data from Bhoomi internal reports, published media reports, and reports from development and funding agencies. The survey of users was conducted with a structured questionnaire while the other interviews were conducted with the help of semi-structured questionnaires. In the first phase about 120 respondents were interviewed, in the period 2003-05.

The second phase of the study was conducted in the period 2006-07 and included interviews of farmers, village and district officials, NGOs, and officials of related agencies. The second phase involved more in-depth interviews that

were conducted in two specific districts of Karnataka, the state in which Bhoomi is implemented.

3   Bhoomi

Bhoomi is a land records management system implemented in 177 sub-districts of the state of Karnataka in India. As such it consists of a distributed database that holds data on the Record of Rights, Tenancy and Crop (RTC) certificate that is associated with each plot of farming land. The system holds about 20 million RTCs that correspond to the same number of land parcels in the state. Farmers can obtain an RTC, an official document needed for various purposes, by going to a Bhoomi kiosk in the sub-district headquarter where they are located. Kiosk operators charge them Rs 15 (about USD 0.33) for each RTC and farmers can obtain these reasonably quickly at the kiosk (however, sometimes the kiosk may be located far away from where they stay).

The Bhoomi system also enables farmers to file a mutation request in the system, where a mutation is a change in the details on the RTC, which may be required, for example, upon sale or inheritance of property. The system logs the request and also generates a ticket for the farmer to see his/her place in the queue for processing the request.

There are many complexities that are related to the design and implementation of Bhoomi. These details are omitted here to conserve space and also because they have been written about and published extensively elsewhere[13].

4   Data and Analysis

This section presents a detailed analysis of the Bhoomi project through the theoretical lenses developed above. Many details about Bhoomi are discussed here, in context, and explanations are provided where needed.

4.1   Withdrawal of the Lower Bureaucracy

One of the significant historical events that bear on the implementation of a system like Bhoomi, a system designed to assist e-governance related to land, is the withdrawal of the lower bureaucracy. The quote below is from an interview of a local official in the Mandya district of Karnataka.

> In 1947, there were 12 village officials/servants: *Shanbagh*, *Gowda*, *Kamhara* (blacksmith), *Badagi* (carpenter), ... All of these posts were (generally) hereditary and there was no salary attached to them. Some land were given as *inam* (gift) to these functionaries for their livelihood; they were however, free to charge for their services. . . . Under the Village Officers Abolition Act of 1961, all the aforesaid 12 posts were abolished. The inam lands were confirmed in the name of the incumbents, there was no other form of compensation.

The respondent shows how the extensive network of village officials was removed by an Act. The rationale for this Act was that the officials presented an excessive 'burden' on villagers (in terms of extracting rents for services). The state however did not entirely withdraw from the village. A bulk of the work that the state retained within its control passed on to the lowest remaining level village official, the village accountant (VA). Another respondent from the same district explained the VA's role thus: "Along with collection of tax (land, water supply and channel maintenance etc.), the VA's main responsibility is maintaining of records - *khata*, RTCs etc. He is also expected to help the villagers in agricultural activities by providing relevant information on government schemes and programmes. He is responsible for providing to the taluk office, information about the actual ground situation in the villages and for preparation of reports required for issue of birth/death certificates, income certificate, BPL and small farmer certificate etc. by the Tehsildar. He also prepares reports for all activities in the village for which government assistance is provided - old age pensions, widow pensions, handicapped assistance etc.; if there is a declared compensation even for snake bite, the report is prepared by the VA. The subsidy that the Agriculture Dept. provides on seeds and other agricultural inputs is also based on the VA's report. These reports are a recent addition in the VA's responsibilities; it did not exist initially in 1969 when the Shanbaghs gave way to the present day VAs." [A khata is a register of land records, a taluk is a sub-district, and a Tehsildar is a district official. A BPL certificate is a below-poverty-line certification.]

Bhoomi was introduced to replace one important function that the VA performed, that of preparing RTCs. Two aspects of this technology introduction are salient: one, the numerous other functions that the VA performed did not have any representation in the computerized system, and, two, only the issuing of the RTC was computerized and moved to the sub-district level. The detailed tasks of updating the RTC records with crop and other details still remained with the VA. The VA fulfills these updating functions thrice a year for crops and on an ad hoc basis for other details.

4.2   Centralization of Authority

The design of Bhoomi, its implementation and the training for it were entirely controlled and managed by the central bureaucratic structure. The Project Champion (PC) for Bhoomi was an IAS officer who planned, executed and maintained the project for a period lasting around 8 years (it is usual for senior officers to be rotated every three years). Successive governments at the state level in Karnataka have retained the same person to head the Bhoomi project, reflecting the political patronage the PC has received.

The responses of interviewees in the first phase of the survey showed clearly the lack of awareness of the Bhoomi system by many of the stakeholders who were finally involved with the system in a direct or indirect manner. All farmers, bank officials, court officials, agriculture marketing officials who were interviewed said that they had not heard of Bhoomi until after it was implemented. All the

district officials interviewed had heard of Bhoomi before its implementation but had not participated in its design. With backing from and personal involvement of the the Chief Minister, the entire system was conceived and designed by the PC and the participating private companies.

To run the operations of the kiosks across the state, a 1000 new VAs were hired (many on sympathetic grounds) and were trained over several months. All high school graduates with a working knowledge of computers, they were "hand picked" and motivated to perform the tasks with energy and diligence. All the trainees were closely watched by the central administration and were given direct access to officers (via mobile phones). (The evidence for these observations was obtained from interviews of new VAs, as well as of the PC).

Control was centralized for the RTC delivery process by first replacing the old VAs with a new, young set with direct loyalty to the central administrators, as opposed to their senior officers at the sub-district, and by removing the maintenance and upgrading of RTCs from the VAs in the villages to the sub-district headquarters.

The design of Bhoomi is such that data on RTCs is collected, updated and stored at the sub-district level, and the records are then uploaded periodically to a central database maintained at Bangalore. At the state headquarters, MIS reports can be generated and used to monitor activities at the district levels. However, the same is not possible at the district and sub-district. Lower officials cannot generate MIS reports comparing their data with other districts, and mostly cannot even see aggregate data on their own. During interviews, VAs reported that access control procedures enable them to upload and modify data but they cannot produce reports. Even district officers such as Tehsildars and Shirestedars have limited access to the data and reports based on the data.

One of the main uses of the RTCs provided by Bhoomi is for obtaining bank loans. Over the years central government schemes and programs have promoted bank loans for rural development. Many banks have perforce set up rural branches to extend loans to farmers. Yet, owing to the tedious processes required to obtain bank loans, some farmers prefer going to traditional moneylenders (who charge much higher interest rates), as they have a better chance of obtaining the loan at a time and under conditions suitable for them.

Village officials of the past had immense power over the farmers. They collected taxes (sometimes upto 50% of the crop) and had high discretionary powers. These officials also allowed farmers some flexibility in payments and an ability to negotiate - as illustrated in a quote from a village official, collected in the second phase of the study: "The cultivators never paid the tax in time or in 1 installment. Hence, various practical arrangements were worked out like accepting the tax in kind and collecting it in various installments spread over multiple years." Village officials were aware of local needs and the conditions under which cultivators lived. They could be more "responsive to local concerns as [power] was decentralized and [they] were aware of individual ownerships etc. which the present day VA, who does not even live in the village, is not aware of."

4.3   The Discourse of De-politicization

The Problems of Land Governance. Land administration in modern India is traced back to the British period when revenues from land were an important source of wealth for the Empire. Land records identified the tenants and cultivators of land and essentially identified the amounts that land holders had to pay in taxes. One aspect of post-independence land revenues is that they constitute a small fraction of the total revenues that the state earns [14]. For example, in Karnataka, the land revenue share was only 0.8% of the total state revenues in 1989-90, down from 23% in 1957-58. A consequence of this drop in revenue is that states have reduced their resources given to land administration, staff have been assigned many other activities and the function of maintaining land records has suffered.

Surveying land and enacting land reforms is a daunting political task in almost all states in India. Owing to deteriorating governance, it is widely believed that a land survey is an occasion for government officials to loot village property [14]. Although surveys are badly needed to address the gross inequities in land records, they are resisted by village residents as well as by the political leadership (as it is a sure way to lose an election).

Land governance and administration is a complicated and politically charged matter. This is due to its historical legacy and the pulls and pressures of multiple legislations enacted by the state and by the central government over the years. Interview responses and secondary data pointed to the following complexities of land governance: there are multiple conflicting and competing claims on the usage of land by different parties (such as departments, defence, private players); rights of tenure can be vested in different bodies, such as a village, a community, etc; marginal populations have special rights; rights are recorded on at least six different types of books and registers, including maps; and land records are outdated. Commentators claim that the real problem with land administration in India that has to be addressed is that of updating and revising land records [15,14].

Framing of the Problem. The framing of the problems of land governance was reduced to a technical one of access: access to RTCs by farmers was impeded by VAs and this formed the basis for corruption, delays and lack of transparency. "Land owners find it difficult to access the Village Accountant, as his duties entail traveling. The time taken by Village Accountants to provide RTCs has ranged from 3 to 30 days depending upon the importance of the record for the farmer and the size of the bribe. A typical bribe for a certificate could range from Rs.100 to Rs.2000. If some details were to be written in an ambiguous fashion, out of selfish motives, the bribe could go up to Rs.10,000. Land records in the custody of Village Accountant were not open for public scrutiny" [16].

The objectives of Bhoomi were also similarly phrased (quoted from [17]).

1. Improving the quality of service to the citizens: (a) Allowing farmers / citizens easy access to their records; (b) Infuse transparency in providing the services to citizens. 2. Ease of administration: (a) Facilitating easy maintenance;

(b) Prompt updation of land records; (c) Making land records tamper proof. 3. Generating meaningful MIS out of the system relating to land records. 4. Ensuring self-sustainability of the project: (a) Robust revenue model; (b) Public-Private partnership, where possible.

The complex problems of land governance are stated in a technical, reductionist language that scopes the problem in narrow terms. It is also interesting to note that the VA is cast as the villain from whom the farmers have to be protected. The function of the VA is reduced to that of simply providing RTCs, for which the system eases access to farmers, ignoring the myriad other aspects of village life for which the VA has to be accessed by the farmer.

At a seminar, the PC responded to a question about the various limitations of the way the Bhoomi system was designed by stating: "Bhoomi is nothing but a database application." The PC then clarified that if the system had to be judged, it should be on parameters that are reserved for technical systems, such as those of efficiency, uptime, security, redundancy, cost effectiveness, economic sustainability etc. That Bhoomi affected the lives of about 30 million people and thus raised a number of social issues, was something the PC was reluctant to address. The de-politicization of Bhoomi was evident, it had to be seen in the high modernist terms of technical functionality, rather than on the terms of the political concerns of farmers.

5   Conclusions

The modern Indian state faces two, almost conflicting, demands on its functions. The first is an urgency to withdraw from many administrative functions owing to pressures of market liberalization that have resulted from the Structural Adjustment package that India adopted in the early 90s at the behest of multi-lateral funding agencies. The second demand that the Indian state faces is that of improved governance. This follows also from the realization that withdrawal of the state can not lead to proper implementation of the programs that structural adjustment had envisaged [18].

Another salient aspect of the reforms in the governance structure of the state is that of the rise of the local elected officials, who have strong regional affiliations, often based on caste and ethnic voter bases. With successive coalition governments at the center, the old order of a strong central party has crumbled, and at the local level there have emerged representatives who demand a different, and provincial, loyalty from the bureaucracy [19].

From Karnataka's example we see that, in post-Independence India, it first withdrew the heavy presence of the lower bureaucracy in villages. This constituted a move away from a perceived feudal system and also a move to establish a more important presence of the Revenue Department of Karnataka. The lower bureaucracy were removed and new governance roles were largely embodied in a single functionary, the VA.

As the demands of the state grew, in terms of governance responsibilities, the VA was called upon to perform a large number of functions, involving almost

all aspects of life in villages. He/she was the main point of contact with the state, for most village residents. The VAs were embedded in complex relations of power, negotiations and transactions that had historic provenance in caste relations, professions, and economic and family relations.

With the introduction of large and powerful e-government systems, such as Bhoomi, the state re-invents itself as, what we call, the *e-State*. This resort to coining new terms is not frivolous; a new term is needed to characterize the manner in which the state re-invents itself with the help of information technology. Some salient characteristics of this nascent state, as different from its older form, are worth noting: 1) The e-State is realized through limited, but powerful, e-government systems that are present at regional locations, with a clear intention to draw away data (resources) from the local and move this over to a center. 2) The e-State is formed by deliberate avoidance of knowledge and priorities of the regional and local officials and citizens. The design of the e-government systems are based on the priorities and design requirements of the center. 3) The functions and processes built into the e-government systems are accessible mainly by the bureaucracy at the center. Local officials enjoy very little access and certainly cannot see information beyond their geographic domain. 4) The e-State functions through a loyal, local bureaucracy, whose interests are aligned with those of the central bureaucracy. These local bureaucrats are especially recruited for their new roles, and are encouraged to break from the entrenched traditions, as the 'modernists.'

The e-State is present in the regional/rural space in a controlled, limited-access, mediated manner. Its presence is of value to farmers, however the new terms under which citizens have to deal with the state undermine traditional, negotiated practices and impose rigid non-negotiable procedures. It is true that the centralized control removes discretionary powers of local officials, and helps to control corruption, but it also encourages farmers to seek alternatives, as in the case of obtaining loans from local money-lenders, that are occasionally worse than the choice provided by the state.

The e-State, finally, is premised on a high modernist discourse and on de-politicization. The language of information technology, economic efficiency, and modernization dominates its description, its justification, its rationale for deployment and also the evaluation of its functionality. Although the e-State maintains a deeply political agenda, its rationalization remains de-politicized, as 'simply a database system.' Further, the e-State denies and limits the complex negotiations that were possible in the 'manual' mode of the state. Interactions amongst officials and citizens, with regard to functions appropriated by the e-government system, have to fall under pre-defined categories and are shaped by the processes already built into the system. Thus, the e-State curbs the political agenda of local officials, while introducing its own centralized controls.

(Although we restrict our analysis in this paper to the case of the Bhoomi system of Karnataka, our observations of other states and other systems in India lead to similar conclusions.)

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Adoption of High Impact Governmental eServices: Seduce or Enforce?

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Abstract. The adoption of high impact governmental e-services is not obvious. Especially small and medium sized companies hesitate to invest and adopt. Non-adoption endangers the realization of the 25% reduction objective within the EU's Lisbon Agenda of the administrative burden of businesses by 2012. On the other hand governmental organisations gain from the use of these e-services. In several cases this is the underlying argument behind the legal enforcement of the use of governmental e-services. In the study reported in this paper we answer the question which factors influence the adoption of these high impact governmental e-services. The designed research model has been tested in an empirical business-to-government context. In contrast to several business-to-business studies we found that especially organisational readiness is a hampering factor for the adoption of these governmental high impact e-services. These findings question the effectiveness of governmental enforcement strategies.

Keywords: high impact governmental e-services, adoption of innovations, governmental pressure, reducing the administrative burden of businesses.

1 Introduction

The Ministerial Declaration of the eGovernment Conference 'Transforming Public Services' formulates targets to be included in the Action Plan for eGovernment under the framework of i2010 [1]. One of these targets concerns: delivering *high impact services* designed around customers' needs. When adopted, integrated and used these kind of services lower transaction costs for businesses and speed up service delivery[1]. In the e-business W@tch 2006/2007 edition the European Commission underlines the importance of governments promoting ICT adoption to the further development of e-business [2]. The adoption of these high impact, and often complex, e-services however is not obvious. Especially small and medium sized companies hesitate to invest and adopt. This is one of the reasons behind the legal obligation of the Danish Electronic Invoicing system. After years of seduction policy the Dutch Tax Administration in 2005 choose to enforce electronic tax filing by businesses [3].

The question is *which factors influence the adoption of these high impact governmental e-services*? Many of these systems when adopted contribute to the reduction of the administrative burden businesses suffer [4]. A 25% reduction of this

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[1] This paper focuses on businesses.

administrative burden by 2012 is an important objective within the EU's Lisbon Agenda. Gaining knowledge helps to design effective ICT introduction strategies and provides new insights into the role of government as a launching customer.

This question is scientifically interesting as well. Little empirical research has been conducted with respect to this business-to-government domain yet. Answering this question asks for the design and testing of business oriented theories and models within the governmental context. In the next paragraphs we present successively the theoretical background of our research and our research model and methodology used. We present results of the first empirical test of the research model and discuss their implications for practitioners and researchers.

2   Theoretical Background

In this study we define high impact services as electronic transaction processing based on mutual data exchange which is an integrated part of existing business management systems. Systems supporting the delivery of high impact services can be characterized as inter-organizational systems. The transaction processing concerns frequent data exchange with regard to e.g. tax filing, social security payments, e-invoicing, customs declarations and statistics. This in contrast with web forms based, non-integrated data exchange with regard to occasional transaction as e.g. permits and the registration of a new company. Extensive research has been conducted regarding these kind of systems and services in the business-to-business context. Many of these studies have used a general MIS perspective or a more specific electronic data exchange perspective. Several meta-analysis have been executed summarizing research results [5], [6], [7].

Less empirical research concerning these high impact services has been conducted within the governmental context[2]. Teo at al. [10] in 1997 studied the mandatory adoption by traders of the TradeNet system in Singapore. Kuan and Chau [11] in 2001 studied the adoption of the ValuNet system of export declarations in Hong Kong.

The application of research results from the business-to-business domain leads to four main aspects characterizing the application of high impact services in the business-to-government domain.

Benefits and effects of high impact services. It has been widely acknowledged that inter-organizational information systems reduce communication costs and improve communication between (business) partners [12], [13]. In many cases these benefits concern first order effects related to the processing, storage, transportation and sharing of data. Second order effects on the other hand demand more complex changes of organizational processes and organization.

Organization of the electronic relation. The electronic data exchange relation between businesses and government can be characterized as an electronic hierarchy [12]. The provider of this kind of a relation is more than others capable of realising

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[2] This confirms with Grönlund's observation that "the field is indeed immature, because theory generation and theory testing are not frequent … and only a few of the cases where theories are either tested or generated concern the role and nature of government" [9].

significant benefits. It is not un-imaginary that governmental organizations profit more form the introduction of high impact services than businesses do [3].

Organizational impact. The application of high impact systems including electronic data exchange has consequences for business organizations. Integration with existing information systems e.g. offers possibilities for cost savings, the so called electronic integration effects [12]. Especially smaller companies find it hard to realise these efficiency benefits [5], [14].

Power and trust. Power and trust are important factors influencing the actual realisation of benefits. The avoidance of mutual dependencies is an important explaining variable for the hesitation of businesses to implement an inter-organizational system [7]. In asymmetric hierarchical relations the use of power is in many cases the main reason for the adoption of an inter-organizational system [14]. Forced adoption in few cases leads to the implementation of integrated systems.

These four themes provide the context for research concerning the application of governmental high impact e-services. While on the one hand benefits do seem very attractive, on the other hand a lack of trust and reluctance to investments might hamper the adoption of governmental high impact services. In this study we applied the theoretical perspective of the adoption of innovations. An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption [8]. High impact systems are indeed innovations to many SME's: application of these kind of systems introduces new goals and complexity, influences organizational procedures and systems and changes the organization's external relationships.

In the next paragraph we present an overview of theories and models that can be used to study the adoption of high impact governmental e-services. Based on this analysis we elaborate one of these models into our research model which we applied in an empirical test.

3   The Adoption of High Impact Services: Theories and Models

Diffusion of Innovations Theory
The central theme of Rogers' DOI theory [8] is the diffusion of innovations within social systems. Rogers defines adoption as: a decision to make full use of an innovation at the best course of action available. The perceived attributes of innovations *relative advantage, compatibility*, *complexity*, *trialability* and *observability* are expected to influence the adoption and diffusion rate of the innovation within the social system. These attributes have been used in many studies concerning the adoption of (inter) organizational information systems. Several researchers however question the applicability of the theory for studying organizational adoption of the adoption of complex inter-organizational systems. Henriksen [5] e.g. concludes that these attributes mainly address internal issues of the innovation from the point of view of voluntary adoption based on perceived needs and preferences. On the contrary, the adoption of high impact e-services is influenced by external (legal) power issues and the organizational willingness to invest in a relationship with governmental organizations. This is one of the reasons researchers use richer adoption models while studying the adoption of complex inter-organizational information systems.

Technology-Organization-Environment model
Tornatzky and Fleischer [15] have developed such an alternative model to study the adoption of technological innovations by organizations. The model contains three variables influencing the adoption decision making process, see figure 1. The *environmental context* is specified by the business sector, governmental influence and competitors. The *organizational context* consists out of the adoption firm size, leadership, formal structure and quality of personnel. The *technological context* is divided into variables addressing the available infrastructure and technology and indicates the degree to which the organization is willing and capable of adopting the technological innovation.
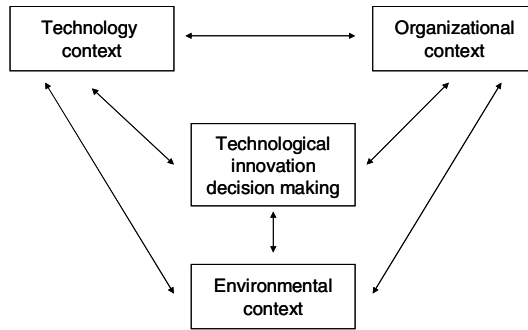
Fig. 1. The Technology-Organization-Environment model, source: [15]

At the beginning of the 21st century several studies have been using and refining this Technology-Organization-Environment model [5]. Kuan and Chau [11] show that adopters experience a higher governmental pressure than the non-adopting firms. Chau [16] in the same research domain concludes *influence by the government* does not hamper adoption. Zhu et al. [17] have based their Electronic Business Adoption Model on Tornatzky and Fleischer's model. They conclude that *firm size* is a significant adoption factor. They also show *competitive pressure* has a significant positive relation with the decision to adopt.

Adoption Model for Electronic Data Interchange Systems
Iacovou et al. [18] have developed a model focussing on the adoption of inter-organizational systems and more specifically electronic data interchange systems by small and medium scale businesses. The model consists of three factors expected to positively influence the organizations adoption decision, see figure 2. The p*erceived benefits* are a specification of Rogers' innovation characteristic relative advantage. Organizatio*nal readiness* refers to the degree to which means are available in terms of financial resources and IT knowledge and experience. *External pressure* relates to the specific inter-organizational character of the system in which dependency, power and trust between partners play a role. The applicability of the framework is empirically demonstrated using the results of seven case studies.

Van Heck and Ribbers [19] were the first to empirically validate the model with respect to the adoption of edi systems in the Netherlands. Their study shows that with
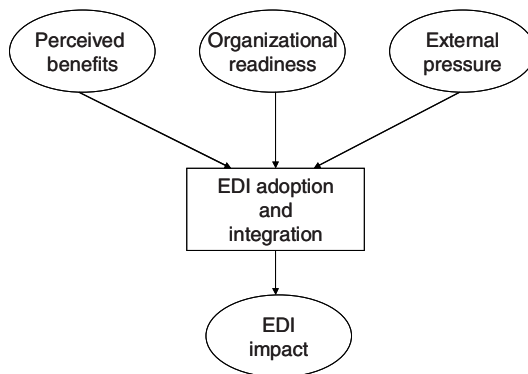
Fig. 2. Adoption model for EDI systems, source [18]

respect to adopters *organizational readiness* has no relation with the adoption decision. The variables *expected benefits* and particularly *external pressure* had a significant positive relation with the adoption decision. Chwelos et al. [20] refined and expanded Iacovou's model. Their empirical study showed that especially *perceived benefits, financial resources and IT sophistication* had a positive relation with the adoption decision. Grandon and Pearson [21] expanded the model towards application and adoption of e-commerce by SME's. Opposite to their expectation organizational readiness appeared not to be an explaining adoption factor. *External pressure* was an explaining factor for the decision of SME's to adopt e-commerce.

4   Research Methodology

In the study presented in this paper we chose to build upon Chwelos' elaborated version of Iacovou's adoption model. We consider Chwelos' model as a more detailed specification of the technological, organizational and environmental aspects of Tornatzky and Fleischer's model. Our *research model* consists out of three explaining variables: external pressure, perceived benefits and organizational readiness. External pressure is specified in terms of the factors governmental pressure and competitive pressure. Organizational readiness is specified in term of the factors adopter characteristics, IT-readiness and financial readiness. We hypothesised that the three explaining variables have a positive relationship with the decision to adopt a high impact governmental e-service.

The operationalisation of the items competitive pressure, perceived benefits, adoption decision, IT readiness and financial readiness has been based on Chwelos' validated questionnaire [20]. Specifically for our research we added questions with regard to governmental pressure, adopter characteristics and perceived disadvantages (opposite to the perceived benefits). *Governmental pressure* has been divided into items stimulating (positive stimuli) and regulating (negative stimuli) the adoption decision. Positive stimuli are e.g. the distribution of free software, technical support or adequate information provision. Regulating measures are e.g. lower quality of service of paper procedures and the legal obligation of electronic data delivery.
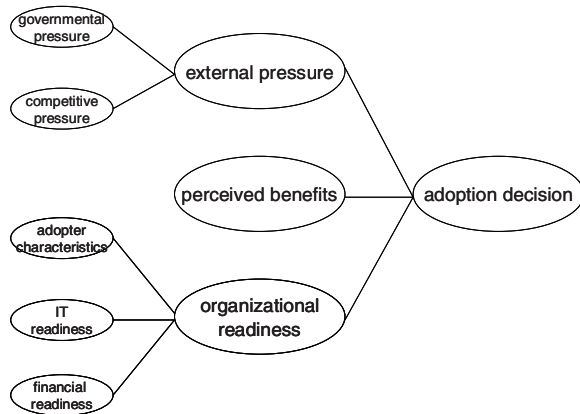
Fig. 3. The research model

Adopter characteristics have been modelled in terms of firm size and the degree of outsourcing of administrative tasks. *Perceived disadvantages* have been partially based on Rogers' attributes compatibility and complexity [8].

The reliability of the model and related questionnaire due to time pressure has been analysed afterwards. Table 1 presents the Cronbach alpha's of the research variables.

Table 1. Reliability of the items

Research variables	Cronbach's α
Governmental pressure	0,898
Stimulation	0,948
Regulation	0,619
Competitive pressure	0,890
Perceived benefits	0,984
Financial readiness	-
Adopter characteristics	-
IT readiness	0,937
Adoption decision	-0,24

The reliability of the variable adopter characteristics as a construct could not be calculated. In the analysis process we used the results of the separate items firm size and outsourcing. The variable financial readiness didn't contain sufficient useful scores. No further statistical analysis have been executed based on this variable. The (sub) factor regulation scores within the grey reliability zone between 0,6 and 0,7. We chose to include this sub factor in some of our statistical analyses.. Because of the low correlation of the sub-constructs it was not possible to compose the variable adoption decision into one construct. As a consequence we had to use the separate items in the analysis process. The other variables show high reliability scores.

Correlation analysis showed (very) strong relations between the variables stimulation, regulation, perceived benefits and IT-readiness. These relationships can

be explained by the frequent appearance of 'benefits' in the related questions. By the way, a similar correlation appears between the variables IT sophistication and perceived benefits in the underlying model by Chwelos [20]. This is not reported in their research paper.

The *population of our survey* consisted of importing and/or exporting companies with a yearly turnover of more than 400.000 euro, 25.000 companies in total. The source of our data collection was the Dutch statistics department's file with business respondents to their survey of international trade statistics in 2004. Based on the EU Intrastat system and the directive 638/2004 on intracommunautary statistics businesses are obliged to file trade related statistics to their domestic statistics department. The Dutch statistics department developed a specific software system Interactive Registration of International Trade Statistics (IRIS). This high impact e-service has been the specific research object of this study. Our research population had been separated into groups of IRIS users (adopters) and users still using paper forms (non-adopters). Following a procedure of aselect sampling we selected 105 businesses which we invited to participate in our survey. The total response at the end of the data collection phase was 25%: 26 completed forms, 16 of which by adopters and 10 by non-adopters. The respondents can be categorized by firm size, see table 2.

Table 2. Respondents firm size, n=26

Firm size (employees)	Respondents (amount)	Respondents (%)	Businesses (Dutch %)[3]
0 till 4	2	8 %	85%
5 till 9	5	19%	6%
10 till 49	7	27%	7%
50 till 99	7	27%	1%
100 or more	5	19%	1%

Eighteen of the twenty-six respondents are industrial companies The response shows an overweight of medium sized (10 till 99 employees) and large companies, related to the overall Dutch spread of business. One explanation can be found in the characterisation of the total population: companies executing international activities with a yearly turnover of more than 400.000 euro are in most cases 'larger' companies. An other explanation could be the fact that smaller companies didn't have/take the time to respond to our questionnaire.

5 Results

The data collected have been analysed with the SPSS program. Caused by the low response rate a total path analysis on the relations within the model, as conducted by Chwelos et al. [20], could not be executed. This research therefore has a qualitative and exploring focus.

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[3] Based on a total number of 720.000 business in the Netherlands in 2005: www.statline.cbs.nl.

Perceived Benefits

Variance analysis does not indicate statistical differences between the groups adopters and non-adopters with respect tot the variable perceived benefits. The absolute scores of both group to the questionnaire however differ clearly. The adopters score above the average[4] $x_{avg=}4$, indicating most benefits have a slight positive effect on the adoption decision. Especially *direct benefits* like e.g. reduction of data entry, less paper work, higher accuracy and more ease of use ($x_{avg}=5,07$) have the highest scores.

Within the sample only the item *perceived disadvantages* in the variance analysis indicates a significant difference between the groups adopters and non-adopters ($F=6,55$, $p < 0,05$). The individual scores in the questionnaire show that perceived disadvantages have a greater influence on the adoption decision of non-adopters than on the adopters' decision. Non-adopters indicate they have been influenced by perceived disadvantages not to adopt. The disadvantages 'too complex'($x_{avg}=6,00$) en 'compatibility problems' ($x_{avg}=5,80$) have the highest average scores and the highest impact on the decision not to adopt.

Firm Size

Table 2 showed that 27% of the respondents is a small company (0 till 9 employees), 54% is a medium sized company and 19% is a large company with 100 or more employees. In table 3 adopters and non-adopters are compared with regard to their firm size.

Table 3. Firm size of adopters and non-adopters.

Firm type	No. of employees	Adopters	Non-adopters
Small scale	0 till 4		2
	5 till 9	2	3
Medium scale	10 till 49	2	5
	50 till 99	7	
Large scale	100 or more	5	

Adopters are statistically significant larger than non-adopters[5]. The groups adopters and non-adopters also differ significantly[6] in the degree to which they outsource administrative tasks: non-adopters outsource more (6 out of 10 respondents) than the adopters (1 out of 16 respondents). Six out of the seven outsourcing respondents are small companies, indicating that all but 1 small business respondents outsourced their administrative tasks.

IT-readiness

Non-adopters perceive their IT-readiness as being 'neutral' whereas adopters perceive their IT-readiness as being 'reasonably mature'. Both groups differ in the degree to which they expect IT to contribute to business goals. Adopters score higher on all suggested goals. The largest difference concerns the expected contribution of IT to *cost reduction.* Adopters score this item as being a 'very important' contribution of IT

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[4] In the used Likert-scale of 1 till 7 $x_{avg=}4$.
[5] $p=0.0002$; the related t-test has been executed based on data presented in table 3.
[6] $p= 0.003$, based on chi square test.

(x_{avg}=6,29); non-adopters score more average (x_{avg} =4,78). This is a statistically significant[7] difference.

Governmental pressure
Adopters and non-adopters differ in the degree to which they perceived *pressure to adopt* by the statistics department. The options in table 4 are ranked in a climbing order of pressure.

Table 4. Perceived governmental pressure, n=25[8]

Perceived pressure	Adopters	Non-adopters
No encouragement	5	1
Received information	8	1
Stat.dep. advised adoption	2	2
Stat.dep. asked to adopt	1	5
Benefits offered	-	-
Disadvantages if non-adoption	-	-

Non-adopters clearly perceived a stronger pressure to adopt the IRIS system than adopters. This difference is significant[9]. Figures indicate that in most cases adoption was voluntarily: adopters hardly perceived any encouragement, instead the receiving information proved in most cases to be sufficient. Despite a higher perceived pressure to adopt, non-adopters however do not adopt. This higher perceived degree of pressure can also be explained as being an effect of the non-adoption decision itself. Non-adopters in 2004 and 2005 became subject of new and focussed 'promotional' actions by the statistics department whereas adopters after their voluntary adoption were not 'pressured' anymore.

Next to that respondents have been asked to indicate the degree to which *stimulation and regulation* had influenced their decision to (non)adopt this governmental e-service. Adopters more than non-adopters perceived all stimulating and regulating items to influence their adoption decision. Non-adopters e.g. score all but one items below the average x_{avg} =4. Non-adopters distinguish however the *stimulating* item 'user and systems management support', which hey score with x_{avg} =4,50 above the average. The less IT-ready non-adopters apparently are best influenced by stimulating measurements that support their weak spots in stead of measurements that impose extra pressure. This could also be part of the explanation of he strong correlation between the variables IT-readiness and stimulation.

The *regulating* item 'difficulties obtaining a license' showed the largest gap between the group scores. This measure seams to influence adopters the most (x_{avg}=5,30) whereas its influence on non-adopters is the least of all (x_{avg}=3,50). This example illustrates again the fact that higher pressure does not positively influence the adoptions decision of non-adopters.

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[7] p=0.08, the related t-test has been based on the underlying individual answers to the related item in the questionnaire.

[8] The data of one of the non-adopters on this item of the questionnaire could not be used in further analysis; leaving 25 useable scores.

[9] p=0.01, the related t-test been based on the underlying individual answers to the related item in the questionnaire.

Competitive pressure

Competitive pressure is not perceived to influence the adoption decision by one of the groups. Both groups indicate that these kind of governmental e-services do not support their competitive advantage (x_{avg}=2,00 and 2,22). Adopters and non-adopters did not perceive imposed pressure by their competitors to adopt this kind of e-services (x_{avg}=1,62 and 2,00). Chwelos et al. [20] in their study on the contrary show that competitive pressure was one of the best explaining variables of the decision to adopt inter-organizational edi systems. An explanation is the fact that Chwelos' study had been conducted in the commercial business-to business environment whereas our study has been executed in the non-commercial business-to-government context.

6   Conclusions

In this research we formulated and tested the hypothesis that perceived benefits, external pressure and organisational readiness have a positive relation with the decision of SME businesses to adopt high impact governmental e-services. Due to a low response rate were we not able to execute a statistical path analysis on the research model. New studies can address this open issue. The qualitative and supporting statistical analysis however provide us with first insights into the adoption behaviour of businesses in the business-to-government context.

1) Adopters perceive a significant higher contribution of the use of IT in general to their ability to cost reduction. The item *perceived disadvantages* significantly differentiates the group adopters and non-adopters: non-adopters perceive more disadvantages especially in terms of complexity and compatibility.

2) In most cases adoption appears to be a voluntarily decision. Non-adopters perceive a significant stronger pressure from the statistics department to adopt than adopters. These non-adopters perceive the most influence of stimulating measurements relating to user and systems management support.

3) Contrary to the results of Van Heck and Ribbers [19] and Grandon and Pearson [21] this research shows *organisational readiness* to be the most impacting adoption factor. The strongest evidence in this research indicates the fact that non-adopters are not able to adopt these kind of high impact governmental e-services. Non-adopters are smaller than adopters and more often outsource administrative tasks than adopters These companies perceive more disadvantages than adopters and indicate the need of assistance on their weaknesses: systems management and use. The stronger perceived governmental pressure does not motivate non-adopters to take the adoption hurdle.

The results of this study in that respect confirm the findings of Chau's study within the governmental context [16]. Chau concludes that "the ability to adopt is more important than the benefits of the adoption" In his research hampering factors for adoption were "lack of knowledge and skills, unsatisfactory internal IT support and non-positive attitude towards adoption". Despite a bias to larger organisations in our study, we draw similar conclusions. We in fact suspect that in reality these factors in case of smaller companies will be even more obvious.

Comparison of these results with findings in the B-to-B context, see e.g. paragraph 3, leads to the strong suggestion that (especially smaller) businesses follow another

adoption approach towards governments than towards fellow businesses. Expected benefits and external competitive pressure seem important adoptions factors in the B-to-B context. The competitive factor stimulates businesses to follow an *offensive strategy*: companies have to invest to gain benefits, to be competitive and to remain a business partner. Within the B-to-G context companies on the contrary seem to tend to a more *defensive strategy*. A lack of organisational readiness makes them reluctant to invest in the use of high impact governmental e-services and thereby in a long term relation with governmental organisations. Given the fact that in many cases governmental organisations are the ones gaining from the use of high impact services, the tendency will grow to legally enforce adoption rather than seduce businesses.

7   Implications

This research presents a first version of an instrument supporting the analysis of the adoption of high impact governmental e-services, founded in the theory of the management of information systems and the adoption of innovations. The empirical studies can be regarded as a usability test within the context of the business-to-government relation, not performed before.

   To practitioners these findings implicate that the introduction of high impact government e-services is not an easy job. Next to internal governmental barriers there is a business related hurdle to take: the readiness of small and medium scale companies. This research challenges those involved to develop alternative adoption strategies. In our opinion three important elements must be part of those strategies: (1) a clear segmentation of businesses involved, (2) a clear and objective elaboration of benefits to be gained by individual businesses, (3) the role of intermediary business organisations. Examples in Scandinavian countries show how these intermediary parties can help to bridge the gap between governments and individual businesses.

   To scientists this study provides a new research model and empirical findings on the basis of which further research can be founded. The model could e.g. be tested in another business-to-government domain or could be elaborated with variables concerning the role of software distributors, the availability of open standards or trust in government. The aspect of trust in this context has hardly been studied. Our second recommendation for further research concerns the usability of segmentations, the channel preferences of businesses and the impact of the use of specific channels on e.g. the administrative burden of businesses.

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eGovernment Project Evaluation: An Integrated Framework

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Abstract. Recently, the EU government has put a lot of effort into modernizing its public sectors using advanced information and communication technology (ICT). Together with various universities and research institutes all over the EU, a number of e-government projects are now undertaken under the 6th/7th Research Framework Programme[1]. One of the critical issues faced by both researchers and the EU government is how to evaluate and assess the successfulness of such projects. The traditional value assessment methods existing in the business field are not good enough to cope with the issue, as business and government hold different value perspectives and have different concerns. In this paper we present a comparative study of six value assessment frameworks and introduce an integrated value assessment framework that may better serve the purpose. A "value cube" and a "step-by-step" method design are generated for supporting the assessment and a real-life case (the Beer Living Lab) for applying the framework in practice is given.

Keywords: e-government, evaluation, assessment, framework, tool supporting.

1 Introduction

Information and communication technology (ICT) has become one of the core elements of managerial reform for creating the best efficiency and comparative advantages. ICT has opened up a new realm for business development in the last decades and now governments all over the world have also seen the opportunities and benefits that ICT may bring in. Many e-government projects are initiated and billions of Euros are/going to be invested. Study of Moon [1] shows that, although e-government has been adopted by many municipals, it is still at an early stage and has not obtained many of the expected outcomes (e.g. cost savings). This creates a growing need for understanding how the adopting public organizations should define the value of e-government, and how the underlying perceptions of e-government value affect

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[1] For further details, see http://cordis.europa.eu/fp7/home_en.html

e-government adoption decisions. One of the critical issues for both researchers and the EU government is how to evaluate and assess the value such projects. However, currently, there is no integrative framework exists that can sufficiently serve such purpose.

In this paper, we address the aforementioned problem by analyzing existing theories and frameworks of IT investment in the public sector, and abstract the applicable propositions derived from past research to e-government settings (Section 2). We propose an integrated value assessment framework and its corresponding *value cube*, and we define a "step-by-step" reasoning approach to evaluate e-government projects in Section 3. A real life case applying the integrated framework is presented in Section 4. We conclude the paper and indicate the future research effort in Section 5.

2   Review of Existing Literature and Value Assessment Frameworks

While assessing value of e-government projects, most people's first reaction is to relate it with commercial interests and evaluate it with monetary terms – how much money does a company make/lose? Indeed, money is the main equalizer of the private sector valuation. Most private sector valuation forms are inevitably related with the *economic value* and measured in monetary terms. Businesses use a sophisticated set of techniques to measure and manage value. Profit, revenue (turnover), cash flow, economic value added (EVA), net present value (NPV), and return on investment (ROI) [e.g.,[2–6]] are all possible mechanisms for business valuation. However, when talking about value in the public sector, the assessment issue becomes much less straightforward, as private businesses and public sectors hold different value perspectives and have different concerns (political, social etc.). Contemporarily, the concept of public sector value is developed by various researchers and organizations [e.g. [7], [8], [9], [10], [11]]. Some new insights of the public value, and more prominently, public value based government evaluation frameworks are presented in these studies. Here below, we give a short review of these frameworks.

Mark Moore's framework: Mark Moore points out that "*the goal of private managers is to create private (economic) value, while the goal of government agencies is to create public (social) value*" [7]. He argues that the strategic problem for public managers is to "imagine and articulate a vision of public value that can command legitimacy and support, and is operationally doable in the domain for which you have responsibility". In order to determine what constitutes public value and to act to produce it, a concept of "strategy in the public sector" is developed. This idea is presented in the diagram "the strategic triangle", which consists of the following three factors. (1) *Task environment* refers to the social conditions managers seek to change. The strategy must be substantively valuable in the sense that the organization produces things of value to overseers, clients, and beneficiaries at low cost in terms of money and authority. (2) *Authorizing environment* refers to the actors from whom public manager needs authorization and resources to survive and be effective. The public enterprise must be able to continually attract both authority and money from the political authorizing environment to which it is ultimately accountable. (3) *Operating environment* refers to the assets and capabilities entrusted to public

manager plus those that the manager can influence, and are required to achieve the desired results. It must be operationally and administratively feasible in that the authorized, valuable activities can actually be accomplished by the existing organization with help from others who can be induced to contribute to the organization's goal.

REDF's SROI framework: In 1996 the Roberts Enterprise Development Fund (REDF) published a retrospective cost benefit analysis of the social purpose enterprises run by a non-profit agency in the San Francisco Bay Area. The study introduced the SROI framework, where the "S" denotes some sort of social mission activity; the "ROI" denotes the use of a business investment analysis. REDF's SROI framework was specifically designed for social purpose enterprises run by non-profit organizations. According to Emerson et al. [12] (REDF), the SROI framework looks at *value creation from the investor's perspective and assumes that value creation occurs simultaneously in three ways along a continuum, ranging from purely economic, to socio-economic, and to social*:

<p align="center">*Economic --- Socio-Economic --- Social*</p>

Economic value is created when there is a financial return on an investment. *Social value* is created when resources, inputs, processes or policies are combined to generate improvements in the lives of individuals or society as a whole. However, it is very difficult agree upon or to quantify the *actual* social value created. *Socio-economic value* measurement builds on the foundation of economic value measurement by quantifying and monetizing certain elements of social value, and incorporating those monetized values with the measures of economic value created. SROI framework incorporates measures of economic value with monetized measures of social value to calculate socio-economic value [13].

U.S. Federal's Value Measurement Methodology (**VMM**): In 2001 the U.S. Social Security Administration (SSA) and the U.S. General Services Administration undertook the task of developing a methodology to assess the value of e-services. Their report [11] built the foundation for the Value Measurement Methodology (VMM). VMM is based on public and private sector business and economic analysis theories and best practice, and provides "the structure, tools and techniques for comprehensive quantitative analysis and comparison of value (benefits) cost and risk at the appropriate level of detail" [11]. Three elements – *value, cost* and *risk* – are analyzed from different perspectives in VMM. It provides a framework and information for making trade-offs among different alternatives, and for striving to *optimize value, minimize cost, and diminish risk*. Moreover, VMM identifies five essential value factors such as direct customer value, social/public value, government financial value, government operational/foundational value, and strategic/political value [see Foley & Hamilton [14]].

UK cabinet's framework: To assess the successfulness of the public service reform, the UK cabinet office developed an analytical framework. In their framework, Kelly & Muers [8] define public value as "*the value created by government through services, laws regulation and other actions*". They argued that in a democracy this value is ultimately defined by the public themselves. Value is determined by citizens'

preferences, expressed through a variety of means and refracted through the decisions of elected politicians. Three categories – *services, outcomes* and *trust* – are addressed as main components of the public value [8].

Accenture's Public Service Value (PSV) model: In 2003 a group of Accenture executives in cooperation with Harvard Kennedy School of Government developed the *Public Service Value model* (PSV model) from the global government practice. The Accenture's PVS model provides "a baseline for comparing performance of a particular government agency over time and/or compared to other agencies" [15]. They consider public value in public service organizations as the public service value and suggest that "*public service value is about more than simply attaining outcomes or just reducing cost; it is about doing both in a balanced fashion, and understanding the strategic trade-offs available along the way*" [9]. They suggest that government managers should look at value from the perspective of the citizen – the primary stakeholder and most important beneficiary of government activities. According to them, *the public value is created based on two criteria: the outcomes they deliver and the cost-effectiveness they achieve* [15]. By focusing also on cost-effectiveness, high-performance government organizations strive not only to do the right things but to do them in the right way.

SAP's Public Return on Investment (PROI) framework: Other than Accenture, another leading commercial organization, SAP, has been working intensively on the issue of evaluating public investment. Cresswell et al. [10] (SAP) present a public value framework (also called the Public Return On Investment (PROI) framework) for evaluating IT investments of the government. Other than most methods for assessing return on investment that focus on financial or economic metrics, the PROI framework includes a much broader view of how IT investments can produce results of value to citizens or to the society as a whole. In their framework, the government is an asset to the community or nation that delivers a wide range of values. Two sources of public returns are mentioned: (1) value to the public that results from improving the government itself from the perspective of the citizens, and (2) value that results from delivering specific benefits directly to persons, groups or the public at large. The framework thus presents a more comprehensive way of describing public value, compared to the previously analyzed frameworks. The public value proposition is composed of six parts based on different impacts that government IT can have on the interests of public stakeholders, including *financial, political, social, strategic, ideological,* and *stewardship* impacts.

A summary of the above six public value frameworks is presented in Table 1, listing the proposition and the main components of a specific value assessment framework. Three main points can be concluded:

1) Similar to the private sector, the public sector can also be seen as service provider to its customers: citizens. Its ultimate goal is to satisfy the needs and demands of citizens and to increase the total social welfare in general.

2) The existing evaluating methods for private sector can be applied by public sector as well. Economic (i.e. financial) value is an important aspect for public value assessment, however, not the only concern: other values like social and strategic/political value need to be taken into account as well.

3) Not as direct as in the *input-output* analysis in the private sector, value assessment in the public sector focuses on *input-outcome* analysis. Outcome evaluating is abstract, and often difficult. "Cost-effectiveness" is one of the most import criteria for such evaluation.

Table 1. Summery of public value frameworks

Name of the framework	Proposed by (author or org.)	Public value proposition	Public value composition
"Public Value" for public strategic management	Mark Moore, Harvard University Kennedy School [7]	*The goal of private managers is to create private (economic) value, while the goal of government agencies is to create public (social) value*	• Task environment: Public value, goals and mission • Authorizing environment: Sources of legitimacy and support • Operating environment: Operational capabilities
Social return on investment framework (SROI)	Roberts Enterprise Development Fund (REDF) [12]	*Value creation from the investor's perspective and assumes that value creation occurs simultaneously in three ways along a continuum, ranging from purely economic, to socio-economic, and to social*	• Economic • Socio-Economic • Social
Value measuring methodology (VMM)	U.S. Federal CIO Council [11]	*It provides the structure, tools and techniques for comprehensive quantitative analysis and comparison of value (benefits) cost and risk at the appropriate level of detail*	• Direct Customer (User) Value • Social (Non-User/Public) Value • Government Operational / Foundational Value • Government Financial Value • Strategic / Political Value
Analytical framework for public service reform	UK cabinet office [8]	*The value created by government through services, laws regulation and other actions*	• Services • Outcomes • Trust
Public service value model (PSV)	Accenture [15]	*Public service value is about more than simply attaining outcomes or just reducing cost; it is about doing both in a balanced fashion, and understanding the strategic trade-offs available along the way;* *The public value is created based on two criteria: the outcomes they deliver and the cost-effectiveness they achieve*	• "Outcomes" are a weighted basket of social achievements • "Cost-effectiveness" is defined as annual expenditure minus capital expenditure, plus capital charge • Nine capacities for creating public value: ➢ Strategy and Policy Making ➢ Organization and Process Design ➢ Performance Management ➢ Partnering ➢ Human Capital Management ➢ Information Management ➢ Marketing and Client Relationship Management ➢ Procurement and Logistics ➢ Operations
Public return on investment framework (PROI)	SAP [10]	*Two sources of public returns: (1) value to the public that results from improving the government itself from the perspective of the citizens, and (2) value that results from delivering specific benefits directly to persons, groups or the public at large*	• Financial • Political • Social • Strategic • Ideological • Stewardship

3   An Integrated Value Assessment Framework

3.1   Three-Level Analysis

Based on the literature study discussed in Section 2, in this session we present our integrated value assessment framework. The framework introduces a "top-down" approach defining three different levels of analysis. First, as a result of the analysis of our literature review, we introduce a value typology, which divides the spectrum of values to four categories. Next, we define key performance areas (KPAs) per value category to refine the value assessment. Finally, every KPA can be measured or assessed by one or more concrete key performance indicators (KPIs).

3.1.1   Value Categories

To proceed with our value assessment framework, we need to understand what the core value categories for public sector organizations are. The literature review in Section 2 provides us a rich resource defining *generic* value categories that we need. Although different frameworks propose different value compositions, Table 2 shows that there exists much overlapping between various frameworks and definitions of value propositions. The common denominator of the various approaches is the following set of value categories for value assessment: financial value, social value, operational (foundational) value and strategic (political) value. These four categories represent a shared understanding of various researchers and practitioners, and can be characterized as follows.

Financial value implies impact on current or anticipated income, asset values, liabilities, entitlements, and other aspects of wealth or risks to any of the above.

Social value implies impact on society as a whole or community relationships, social mobility, status, and identity. Social and psychological returns include increased social status, relationships, or opportunities; increased safety, trust in government, and economic well-being.

Operational (Foundational) value implies impact in realized operations and processes and in laying the groundwork for future initiatives.

Strategic (Political) value implies impact on personal or corporate influence on government actions or policy, on role in political affairs, or influence on political parties or prospects for current of future public office, including impacts on political advantage or opportunities, goals, resources for innovation or planning.

One of the important goals for an e-government project is to promote collaborations (between G2G, G2C and G2B) with IT enabled procedure redesign. We find that the proposed value categories are rich enough to cover most the concerns, including private and public financial interest (financial value), the social consideration of the public sector (social value), the operational benefit from the procedure/process redesign (operational value) and, last but not least the strategic planning for the business and political challenges for the EU government (strategic value).

3.1.2 Key Performance Areas

Key performance areas, referred to as KPAs, are areas for project success factors that embed an improved performance of an organization (e. g. cargo safety). They are initiated by specific goals or demand that an e-government initiative aims to satisfy. A KPA can be assessed via one or more concrete KPIs (see next paragraph), which are all related to this specific area. This hierarchy enables a transparent and aggregated view of a large number of KPIs, especially for big organizations with complex structures and heterogeneous business. For strategic organization's planning, the first step is to define a set of goals and related success factors on KPA level. Goals and factors can be then further refined by using different KPIs.

3.1.3 Key Performance Indicators

Key performance indicators (KPIs) are quantitative or qualitative measurements, which reflect the project success factors and address the performance of an organization. While the concept of KPI stems from finance, where KPIs are quantitative and measurable; we studied 7 cases (available upon request) involving public sector organizations and found that KPIs can also be qualitative, which may not necessarily be measured with a quantitative measurement (e.g. acceptance of standards). Often more than one KPI is related to the same success factor. In that way different areas of interest can be evaluated and explored whether a specific organization's goal is achieved. Depending on the characteristics of an organization (e.g. public or private), KPIs differ. They are either long term considerations, or refer to a specific period, during which their values will be collected, measured or assessed. The definition of what they are and how they are measured or assessed, however, does not change often. It is important to stay with the same definition of the KPI from year to year or the particular time period. Each KPI must be correctly defined by a specific target e. g. gained profit (best as a fixed value), the period of validation (e.g. month or year), considerations (e.g. by units), the unit of measurement (e.g. EURO per months) and a description how to assess/measure it respectively how and where the data can be collected.

3.2 Value Cube and a "Step-by-Step" Evaluation Method Approach

3.2.1 Value Cube: Stakeholder Specific and Network Concerned Assessment

The realization of any e-government project requires a cooperative effort from both public (e.g. government authorities) and private sectors (e.g. IT service providers). Stakehodelrs with different interests (e.g. commercial interest of service providers, legal interest of governments) perfrom different functionalities to provide benefits for the end costumers. One of the challenges while reasoning over a potential successs or failure of an initiated e-government project is, however, that stakeholder benefits have a broad interpretation due to the diverse interests of stakeholders. Thus, to find a way to assess the 'real value' of an e-government project is not as straightforward, as it should be done from multiple viewpoints of stakeholders. In the private sector value is mostly measured in financial terms, i.e., a solution is proved to be beneficial if it results in financial advantages. Issues like security, trust or improvement in social efficiency, which are of great importance for public sectors, cannot be easily measured in terms of money, adding another complexity to our task. The challenge
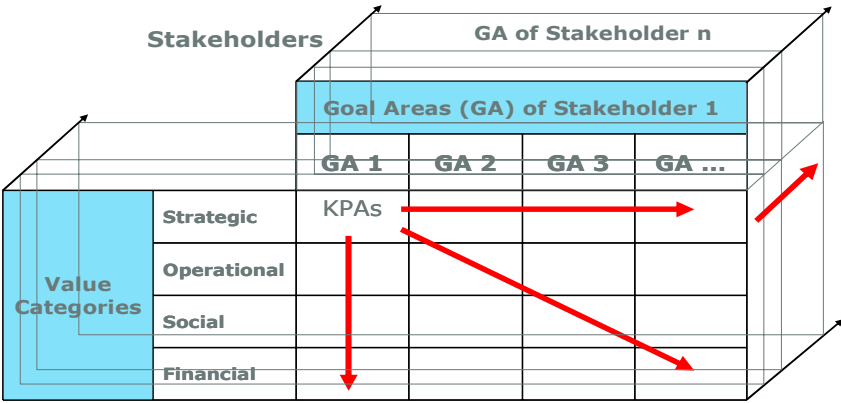
Fig. 1. The "Value Cube"

with these emerging conflicts is to find an acceptable networked value constellation, consisting of stakeholders from *both* the public and the private sector, which realizes the initiatives of an e-government project, and where each stakeholder can find her own benefit. To this end, we performed a study on the notion of stakeholder value, and we articulated a *value cube* that we further use to guide our evaluation process (see Figure 1).

The value cube is structured as follows. First, it shows the goals of the analyzed project (columns) and puts them in relation to the value categories (rows), giving an overview of the Key Performance Areas (per combination of row and column, see Figure 1). Once the matrix has been elicited, we define Key Performance Indicators for the KPAs that are initiated in the matrix. As the assessment of the full value matrix can be very time consuming, stakeholders can prioritize the KPAs and KPIs that they wish to assess. The value matrix is stakeholder-specific. As the KPAs and KPIs of various actors may be inter-related, to emphasize the network perspective on value assessment, vertical payers of the matrix are plugged in according to the number of stakeholders involved.

3.2.2   A "Step-by-Step" Evaluation Method Approach

Our "value cube" is a light-weight approach to summarize the different concepts that are essential to explore stakeholder value. However, it does not give any suggestions on *how* to assess the value impacts that are embedded in the execution of e-government projects. In addition, it does not assist in measuring different cross-cutting impacts on stakeholder value, caused by common interests among different stakeholders. To do so, we further detail our value assessment and introduce a step-by-step approach (Figure 2) that guides us to achieve this goal.

The method is described using UML class diagram [16] in Figure 2. First, there are certain strategic initiatives of any e-government project, such as security, reduction of administrative burden and compliance that calls for an alternative,
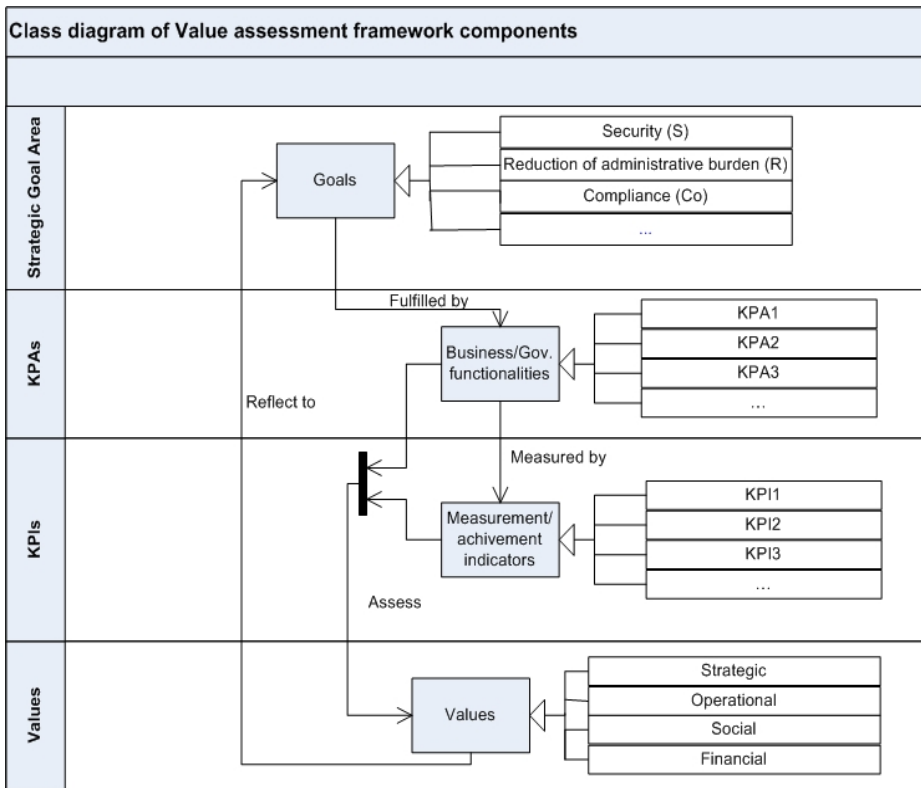
Fig. 2. Model based method for deploying the value assessment

IT-intensive solution. In order to achieve these goals, stakeholders from both public and private sector form a networked constellation execute different activities to fulfil various business/government functionalities. In other words: they operationalize the strategic goals by activating value creating functionalities. KPAs are stand for key performance areas, which are originated from these business/government functionalities, and are the focal areas that we need to pay special attention to the value assessment. These KPAs are measured by selected indicators (KPIs). They can be either quantitative or qualitative measurements, which reflect the successfulness of the focal functionalities: the KPAs. Further, these business/government functionalities (presented as KPAs in the framework) and their measurements (KPIs) provide reliable assessment of the various value impacts perceived by different stakeholders. In the mean time, these value impacts also reflect to the strategic level, and assist in exploring which goals are fulfilled and to what extend. The task of measuring and/or assessing the particular KPI is still challenging. Whereas we assume, that there exist some methods of measuring (especially financial) KPIs in the companies, we also aim to provide support for developing method of assessing the indicators of improvement in collaboration with the companies/administrations.

4   Application: Assessing the Beer Living Lab

4.1   Background

The EU is currently initiating several eCustoms projects to reshape its customs legislation and practices with expectation to achieve seamless eCustoms procedures over EU member states. The reasons for such initiative are threefold. First, the threat of terrorism resulted in new control regulations to meet strict security and safety requirements. Second, the increasing excise and VAT fraud in the EU calls for the need of reshaping existing control mechanisms. Third, there is an articulated need by EU to reduce administrative burden, and so to keep the EU a competitive economic zone. Efficiency and reducing administrative burden however can easily contradict with increased security, safety and control. To meet all aforementioned requirements, new customs procedures are required.

The Beer Living Lab (BeerLL) is a pilot of the EU-funded ITAIDE (see www.itaide.org) project for redesigning these EU Customs procedures in the beer industry, focusing on shipments of excise goods. The redesign in BeerLL uses innovative information technology (including GPS traceable e-seals, distributed database, and SOA supported information sharing scheme) to meet the above described EU eCustoms initiatives. Five major stakeholders are involved in the BeerLL pilot, which are Heineken; Dutch Tax and Customs; Safmarine (Ocean carrier); IBM (technology and service provider) and EPCGlobal (standard provider).

4.2   Value Assessment (Progress Description)

As elicited in Figure 2, first we identify the general goal areas of the living lab. *Goal areas* are areas where key goals of the Living Lab should be achieved. Based on interviews and workshops with stakeholders, we identified three generic goal areas that hold for BeerLL, which are(1) security, (2) reduction of administrative burden; and (3) compliance (of trading businesses with trade-related regulations). Following, we develop the *value matrix* for each stakeholder (Figure 3). The idea of the value matrix is to provide a basic framework with generic goal areas and value categories. For each goal we provide a set of KPAs (Figure 3).

As a next step, we define a set of specific KPIs for every KPA. In the BeerLL a new trade procedure has been suggested that increases security and control in container-based international trade (and at the same time promotes other key customs visions). We can identify social value for the goal area "security" when considering the Dutch Tax and Customs Administration as focal stakeholder. The KPA from where this kind of value emerges is 'safety of international trade'. Safety is still very generic and therefore not measurable directly. The KPIs for this goal area could be defined as "controls per containers shipped" or "number of detected smugglings". While these KPIs would be valid for Dutch Tax and Customs (trading companies would use different KPIs for assessing their value of the Beer Living Lab, even if they want to measure their 'safety' outcome), the general goal area 'safety of international trade' may be valid for more stakeholders (from the private and public sectors).

In companying with the value matrix, a set of questionnaires are developed for each stakeholder, the questionnaire includes ranking of the KPAs and further detailed

		Goal Areas (GA)		
		Security	Reduction of Administrative Burden	Compliance
Value Categories	Strategic		- Policy - Governance - Strategic position - Fulfilling the organization - mission - Public opinion	
	Operational		- Productivity gains - Service quality - Improved infrastructure - Convenient access - Governance - Compliance	
	Social		- Safety - Health - Environment - Increased confidence in government - Increased trust in government - Employee satisfaction	
	Financial		- Cost savings - Cost avoidance - Budget increase - Cost effectiveness	

Fig. 3. Value matrix for BeerLL

KPI calculations. To the end, we analyze and compare (AS-IS vs. TO-BE) the results and in the mean time communicate the results with stakeholders to reach a common understanding among all the parties. [Details are skipped in this paper].

5   Conclusion and Future Research

In this paper we propose an integrated value assessment framework for evaluating the e-government projects. The paper contributes to the academic literature of public sector IT investments by explaining the multidimensional nature of value for the e-government projects. More specifically, the proposed conceptual framework emphasizes the important concerns of multiple value dimensions (financial, social, political/strategic and operational) and multiple stakeholders for the e-government project valuation. Further more, we create a lightweight virtualization of the assessment framework with "Value Cube" and UML model based "step by step" evaluation approach. The two artefacts are proven to be very effective and declarative during the interviews and workshops with stakeholders, which can create a vivid and communicative environment for the value assessment in practice.

There exist some limitations in the research: first, our framework is developed under the G2B context, though it manages to cover most of the aspects in this context, other concerns (e.g. G2G and G2C) may still be ignored; second, for the moment we do not have any specific guidelines for measuring KPIs, all of which are currently

depend on and assessed by stakeholders themselves that may create subjective evaluation bias. Anyhow, these limitations also indicate our future research directions. We will dig into these issues and wish to get solutions for them in the future.

Acknowledgments

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Managing Benefits in the Public Sector. Surveying Expectations and Outcomes in Norwegian Government Agencies

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Abstract. Government agencies currently experience increasing pressure to document benefits from spending on eGovernment efforts. Hence, structured methods for benefits management (BM) are being developed. However, hardly any studies have investigated how such approaches are used and experienced. This study addresses this practice-research gap by reporting a study of a project involving 30 Norwegian government agencies using a common BM approach. A questionnaire was answered by project managers. Results show that that some 80 % of the managers considered their early quantifications of expected benefits to be realistic. Further, the managers found the approach useful. They felt projects became more focused, and expect to continue working with a BM approach. While the benefits that were identified and quantified in the reported projects represent estimates and not measurements, this study shows that BM can be useful – and even welcomed – in eGovernment projects and that demonstrating benefits from such projects can be accomplished.

Keywords: Benefits management, benefits realization, survey.

1   Introduction

Challenges related to calculating and demonstrating value from eGovernment efforts are emerging as one of the key barriers to the development of eGovernment [1]. The difficulties in calculating tangible long term benefits to offset clear, often apparently high, short term costs can severely hamper the speed and scope of eGovernment progress [1]. It is a challenge to find adequate ways of calculating benefits as such calculations should be based on public sector value models (see e.g. [2, 3]). In contrast to the business sector, the public sector has to increase not only economic values but also social (e.g. equality and rule of law) and democratic ones, such as equality, openness and transparency. Not only does this add to the list of goals to be strived for, also the different categories of goals may be in conflict with each other [4]. Public sector activities also involve a wide variety of target stakeholders [5, 6] and hence requires difficult trade-offs.

Despite the challenges related to crafting proper assessment frameworks, there has long been strong political pressure to document effects from eGovernment efforts. International action plans like the i2010 plan from the European Union explicitly underlines the importance of realizing and documenting value from eGovernment efforts [7]. Also, national action plan like the Norwegian government's eNorway 2009 plan [8] and the Norwegian Association for Municipalities' eKommune 2009 plan [9] encourage focus on – and to some extent demand - documentation and realization of benefits.

To cater for the increasing demands to demonstrate clear benefits from eGovernment efforts, efforts have been initiated to develop adequate assessment frameworks. Both the EU and OECD have sponsored such developments resulting in e.g. the eGEP assessment framework [2].

While promising assessment frameworks are appearing, the existence of usable frameworks is no guarantee for successful documentation and realization of benefits. Rather, it has been argued that the biggest untapped potential for service improvement relates to resources and improved management [10]. Hence structured approaches to managing and realizing benefits are being suggested to assist agencies in the process of managing their eGovernment efforts. Such frameworks are generally referred to as Benefits Management (BM) or Benefits Realization (BR) and can be described as approaches to assist proper identification, management and realization of benefits using appropriate tools and techniques [11]. Examples of elaborate frameworks for BM and BR include the Benefits Management Model [11] and Active Benefits Realization [12]. However, some concerns can rightfully be advocated. For instance that BM and BR frameworks have been developed to support for-profit organizations and that they have only received limited empirical validation [13]. It is thus poorly documented that such approaches actually work equally well in public sector contexts as in the for-profit sector.

To start addressing this knowledge gap, this study investigates public managers' experiences with a comprehensive effort to implement a structured approach to benefits management in eGovernment projects. The case at hand is Research Council Norway's Høykom program where 48 projects used a structured approach to benefits management. Because this is an innovative approach in the Norwegian public sector we investigated not only the outcomes of this set of projects but also the effect on working methods and prospective changes in these. We considered it important to try to estimate the potential of implementing benefits management in the public sector, and these projects are only precursors. Full implementation would require consistent use of clear methods as well as development of useful and practical goals for public sector activities. While using the same BM method, the project studied here used locally defined goals which makes comparison of actual results hard; however effects on working methods can be realistically assessed.

The study was based on three research questions. The first one asked, **How reliable are up-front benefit estimates?** We had noted that similar projects had specified prospected benefits very differently [14] and hence hypothesized that;

H1-1; The quantification of expected benefits in the Høykom-program has been inaccurate.

Acknowledging the major problems with measuring effects of eGov projects [2, 3], research question 2 looked for changes in the way projects were planned and pursued

as compared to before the BM project. If actual measurement of outcomes is hard, at least changes in work methods are visible and the nature of these changes at least give indications of changes in outcomes – the very act of formulating goals and trying to assess them increases focus on these goals. As comprehensive evaluations had not yet been done in the municipalities, we saw impact on procedures as a proxy variable, hence RQ2; **What has been the actual and/or perceived impact of Høykom's BM approach in Norwegian municipalities?** Here we hypothesized that the approach would lead to positive reactions and a higher degree of goal-orientation in everyday work, and that this would be experienced positively:

H2-1; The explicit focus on project benefits in the Høykom program has led to a more pertinent identification of potential benefits in the projects.
H2-2; Benefits realization in the Høykom program was perceived as useful.
H2-3; Agencies that have experienced benefits realization/management are likely to continue with some form of benefits management.
H2-4; Benefits management/realization leads to an improved and more unified understanding of the purpose of the organization among the employees.

These four hypotheses were all closely related to the goals of the Høykom BM approach. Research question 3 focused more generally on understanding of how a BM approach should best be implemented in the public sector; **What are the main challenges in terms of identifying and realizing benefits from eGovernment projects in Norwegian municipalities?** Our hypotheses on this point stemmed from the Norwegian public sector's history of being budget-oriented and, we hypothesized, not quite ready for a BM approach:

H3-1; Norwegian public agencies lack an organizational culture that is necessary to support benefits realization/benefits management.
H3-2; Norwegian public agencies are not aware of available techniques to support benefits realization/management.
H3-3; Norwegian public agencies lack the competence that is necessary to successfully realize benefits from ICT-projects.

The paper is structured as follows. First we describe our choice of research approach. Second, the case is described. We then present and discuss the results. Finally some conclusions are presented.

2   Method

This study was initiated and funded by Research Council Norway (RCN). In fall 2005, KSeF, the Norwegian competence centre for e-Government where one of the authors is employed, was asked to assess and evaluate the benefits management approach that had been developed and implemented for use in a particular RCN program Høykom (see Section 3).

All Høykom projects that used the benefits management approach were invited as respondents for our survey. In all, 48 projects had used the approach. However, the survey was only sent out to 42 respondents as some managed more than one project.

The project managers in the Høykom projects were the persons with most hands-on experience with BM and were consequently chosen as respondents to the survey. The project managers were approached in mid November 2007, by e-mail, with a letter from the director of the Høykom program encouraging them to participate in the survey and a hyperlink to the survey itself. One reminder was sent out and the survey was closed in mid January 2008. Of the 42 respondents, 30 took the time to fill out the questionnaire resulting in a response rate of 63 %.

In addition to responses regarding the project the following background variables were used: Municipality size, Project type (e.g. internal vs external focus), and Sector (e.g. municipal vs national government). Because these variables typically have importance for the outcome of eGovernment projects we expected that as BM requires both professional skill, available municipal data and resources to measure both baseline and outcomes larger municipalities, engineering-type projects and scale advantages (more common in national government sector than in municipalities) would make a difference.

We asked a total of 36 questions, most of which were formulated as an assertion which respondents rated by a 6-grade scale where 1 meant "strongly disagree" and 6 "strongly agree". For some of the ratings, open-ended questions asking for explanations were added.

The projects studied here started in 2005 and are now completed. They have been investigated underway in terms of surveys of planned goals and pre-project estimates of benefits. The present study investigates the situation after project completion. Goals were different in different projects. Hence the only comparable data we could get were estimates by the project managers. Clearly they have a stake in the projects which might flaw their opinions. However, they also have a stake in achieving goals and consistence between planning and outcome. Therefore their estimates of the pre- and post situations may be relatively credible. As regards their opinions of the qualities and capabilities of their own organizations, however, they are clearly biased. To improve reliability of the investigation we also checked for consistency in their answers, for example between perceived results, assessments of the method used, and plans for the future in their organization. It would appear unlikely, for example, for project leaders to claim that results were positive and they plan to use a BM approach again unless they also truly feel your organization can indeed handle it.

3   Case Description

In 1999, the Norwegian government established a national development program, Høykom, to stimulate broadband development in scarcely populated areas that had so far been neglected by commercial vendors. Research Council Norway (RCN) was made responsible for administering the program. Since 1999, Høykom has supported more than 500 projects with nearly $100 million (US). The main focus of Høykom has been to ensure high-speed Internet connection throughout Norway. However, a portion of the funding has been allocated to developing content to be distributed through broadband connection, mainly electronic services to citizens.

Spurred by political pressure from the Ministry of Modernization and a desire to facilitate and document effects of the program, the Høykom administration developed

an approach to BM in 2005. The approach was initially piloted in 17 projects, then revised and applied to a wider set of projects. In brief, the approach consists of assessments and reporting routines at four distinct project phases:

1. Before project start-up: initial cost/benefit analysis to accompany the project proposal when applying for financial support from Høykom;
2. During the project phase: a specific, detailed plan of expected benefits from the project. The plan is seen as an instrument for the project manager;
3. By project sign-off: When the project manager hands over the results of the project, the project owner should develop a benefits realization plan that clearly states which benefits the organization will pursue (based on the plan of expected benefits from the project manager) and how the organization intends to act to ensure that specific benefits are actually realized;
4. During the operative phase: Roughly a year into the operative phase, the project owner should assess the effects of the project and account for which and how eventual benefits were actually realized. [14]

During the period of 2005 to 2007, 54 projects were selected to use the BM approach. Projects were selected by the Høykom administration based on the nature of the projects. Pure infrastructure projects were excluded as their effects were considered too indirect, i.e. providing only a basis for establishing value creation, no directly doing it. Of the 54 projects that were selected by the program board, 48 have used the approach to benefits management actively. The Høykom program is scheduled for termination during 2008 and is now evaluating and summarizing the overall usefulness of the program.

4   Findings and Discussion

In this section we present the results from the questionnaires by research question and comment these results. (For all tables below, 1 means "strongly disagree" and 6 means "strongly agree").

4.1   Precision in Up-Front Benefit Estimates

Our first research question asked what caused the diverse and imprecise quantification of potential benefits in the Høykom projects that we had noted.

H1: The quantification of expected benefits in the Høykom-program has been inaccurate.

This hypothesis was confirmed, however not strongly. 80 % of the managers considered after the project that their early estimates had been realistic, while 20 % said they had overestimated them. This largely positive view is tempered by support for the assertions that defining and measuring benefits beforehand is problematic with more than 1/3 of the managers claiming this to be hard or very hard (Table 1). While clearly the post-project estimates are also subjective, pre-project estimates were rather over-optimistic. The explanations given include reasons such as, "hard to identify user benefits"; "hard to actually realize benefits as responsibility for that is not defined, for

Table 1. Results for Hypothesis 1

H1: The quantification of expected benefits in the Høykom program has been inaccurate.						
” It is hard to identify a comprehensive set of benefits in advance”						
Score	1	2	3	4	5	6
%	0	30	33	20	10	7
Mean: 3.3						
”It is hard to measure benefits by numbers”						
Score	1	2	3	4	5	6
%	0	17	27	27	17	13
Mean: 3.8						

example because central government prohibits certain things and picks up the prospected benefits for other things. This means that even if estimates were in principle realistic, realizing them could still prove hard.There is, hence, a potential contradiction between the answers to the different questions. One explanation to the differences might be that precisely because it was hard to define benefits beforehand managers took a conservative approach and defined only "safe" ones, ones they could more easily inspect afterwards, hence the positive review of their early estimates.

4.2 Impact of Benefits Management

Our second research question asked about the actual and perceived impact of Høykom's Benefits Management approach. Four hypotheses were related to this.

H2-1: The explicit focus on project benefits in the Høykom program has led to a more pertinent identification of potential benefits in the projects.

This hypothesis was strongly confirmed with an average score of 4.8 for the three assertions measuring focus on benefits (Table 2). However, this positive view was tempered by concerns that focus on measuring benefits had led to disregard of benefits that could not be easily made visible (m=3). 1/3 of the managers report such concerns.

These responses are surprisingly positive in comparison to those related to measuring the difficulty of defining and measuring benefits (in RQ1). The answers here should therefore be seen as reflecting a change for the better rather than an absolute ability (which is precisely what the question asks). While the responses indicate a clear support for H2-1, the response to the 4th assertion shows that there was indeed a change of focus towards measurable effects, 68 % score 3 or higher, although the change was not rated as strong.

H2-2: Benefits realization in the Høykom program was perceived as useful.

This hypothesis was also strongly confirmed (Table 3). BM work was very positively received (mean = 4.6). The particular method used in this project was also positively received, however more moderately (average=4,1 for two questions).

The mean of 2.6 on the last assertion is a weak disagree. Many – 27 % – found there was at least some unnecessary administrative work involved. This might be a

Table 2. Results for Hypothesis 2-1

H2-1: The explicit focus on project benefits in the Høykom program has led to a more pertinent identification of potential benefits in the projects.					
"Focus on benefits management makes the organization better equipped to define effects of projects"					
Score	1	2	3	4	5	6
%	3	0	0	20	27	50
Mean: 5.2					
"Focus on benefits management makes the organization better equipped to realize effects of projects"					
Score	1	2	3	4	5	6
%	3	0	3	17	30	47
Mean: 5.1					
"Focus on benefits management made my project more concerned with making effects of projects visible"					
Score	1	2	3	4	5	6
%	7	3	13	37	33	7
Mean: 4.1					
"Focus on benefits management led to less focus on effects that are hard to measure"					
Score	1	2	3	4	5	6
%	14	17	38	24	3	3
Mean: 3					

Table 3. Results for Hypothesis 2-2

H2-2: Benefits realization in the Høykom program was perceived as useful.					
"The work with benefits management was useful"					
Score	1	2	3	4	5	6
%	0	7	7	7	40	20
Mean: 4.6					
"The report model for benefit plans gave proper support in identifying benefits/effects of the project"					
Score	1	2	3	4	5	6
%	0	10	13	33	37	7
Mean: 4.2					
"The template for benefits realization plan gave proper support for the work with actually realizing benefits"					
Score	1	2	3	4	5	6
%	0	7	18	46	25	4
Mean: 4					
"The routines for reporting benefits added unnecessary administrative work"					
Score	1	2	3	4	5	6
%	14	45	14	20	7	0
Mean: 2.6					

criticism of this particular model, but the replies should also be seen as a caveat – previous questions have showed benefits realization to be weak and unsubstantiated; the replies to this question exhibit some dissatisfaction with the extra work. This

Table 4. Results for Hypothesis 2-3

H2-3: Agencies that have experienced benefits realization/management are likely to continue with some form of benefits management					
"It is likely that my organization will continue to use some form of benefits management in forthcoming projects"					
Score	1	2	3	4	5	6
%	0	4	11	32	32	21
Mean: 4.6					
"It is likely that my organization will continue to use Hoykom's method for benefits management in forthcoming projects"					
Score	1	2	3	4	5	6
%	4	15	11	41	30	0
Mean: 3.8					

Table 5. Results for Hypothesis 2-4

H2-4: Benefits management/realization leads to an improved and more unified understanding of the purpose of the organization among the employees					
"Practical work with benefits management makes employees better understand other parts of the organization that the one where they work"					
Score	1	2	3	4	5	6
%	0	3	10	30	27	30
Mean: 4.7					
"Making benefits visible makes it easier to engage key staff in the project"					
Score	1	2	3	4	5	6
%	0	3	7	43	27	20
Mean: 4.5					
"Focus on benefits realization makes it easier for the organization to understand if and how individual projects contribute to the organization's overall goals"					
Score	1	2	3	4	5	6
%	0	3	7	27	33	30
Mean: 4.8					
"It has been hard to make the employees understand how the work with benefits realization benefits our organization"					
Score	1	2	3	4	5	6
%	13	17	13	37	13	7
Mean: 3.4					

suggests further attempts to implement benefits management should be careful to focus on measurable benefits, means to realize them, and make sure methods used are as simple and straight-forward as possible.

H2-3: Agencies that have experienced benefits realization/management are likely to continue with some form of benefits management.

Confirming the results on the previous hypothesis, a mean of 4.6 (Table 4) shows that those who have experienced this project positively (first assertion for H2-2) also expect to continue with benefits management (the correlation is significant, sig=.031).

Also confirmatory not all expect to use this particular approach (m=3,8). Correlation between these replies and those for assertions 2 and 3 for H2-2 is also here significant (sig = .017).

H2-4: Benefits management/realization leads to an improved and more unified understanding of the purpose of the organization among the employees.

Table 5 shows that this hypothesis was strongly confirmed (average mean=4,7 for three questions). However, tempering this positive view is that many managers also felt it was hard to motivate the employees (4th assertion in Table 5).

This means, at least, that this understanding is not equally enthusiastically shared by all. It should be noted, again, that the employees were not asked directly. It is an open question whether or not a survey among staff would be more or less negative; however, the numbers show that at least the project managers met some resistance and hesitation.

4.3   Conditions and Challenges for Benefits Management

Our final research question (RQ3) asked more broadly about the preconditions for implementing a benefits management approach in the Norwegian public sector; "**What are the main challenges in terms of identifying and realizing benefits from eGovernment projects in Norwegian municipalities?**"

H3-1: Norwegian public agencies lack an organizational culture that is necessary to support benefits realization/benefits management.

This hypothesis was rejected (Table 6). Managers generally felt their organisation had a culture where a benefits management approach fits in. They had good financial management, they felt it reasonable to measure costs against effects, and they felt it worthwhile to spend resources on defining and – in particular – measuring effect variables. To caveat this high self-confidence it should be remembered that managers also confirmed difficulties with defining and measuring benefit variables. This means that the positive answers here should rather be interpreted in terms of there being fertile soil for a benefits management approach while there still is some work to be done to properly implement it.

It should be noted that while the last assertion was rejected, still 30 % of the project managers are supporting it which at least indicates that there is indeed an element of worry among the staff.

H3-2: Norwegian public agencies are not aware of available techniques to support benefits realization/management.

The average score on this point was 3 with 56 % answering 3 or 4 (Table 7). This is a rather neutral answer 1/3 of the managers said there are not good such techniques, but we did not go on to investigate whether they don't know about the existence of such methods of if they don't think they are good. One reason we did not ask is because labels on methods may differ; while there is in many municipalities different methods for assessing and follow up on goals these may not be called benefits management. This hypothesis, hence, remains undecided.

Table 6. Results for Hypothesis 3-1

H3-1: Norwegian public agencies lack an organizational culture that is necessary to support benefits realization/benefits management						
"The idea of measuring costs against expected benefits is not suitable for public sector organizations"						
Score	1	2	3	4	5	6
%	23	43	23	7	3	0
Mean: 2.2						
"I would have liked to use more resources to define benefits and effects in my projects"						
Score	1	2	3	4	5	6
%	3	17	17	23	27	13
Mean: 4.3						
"I would have liked to use more resources to follow up and identify benefits and effects in my projects"						
Score	1	2	3	4	5	6
%	0	10	7	43	27	3
Mean: 4.3						
"My organization has good and detailed financial management making it easy to see effects of new projects"						
Score	1	2	3	4	5	6
%	3	7	33	37	17	3
Mean: 3.7						
"My organization has good experience of making quantitative assessments of effects of new projects"						
Score	1	2	3	4	5	6
%	3	20	27	43	3	3
Mean: 3.3						
"The employees feel threatened by routines designed to support measurement of benefits"						
Score	1	2	3	4	5	6
%	23	30	17	20	10	0
Mean: 2.6						

Table 7. Results for Hypothesis 3-2

H3-2: Norwegian public agencies are not aware of available techniques to support benefits realization/management.						
"There are not good techniques to support work with defining and following up ICT projects in the public sector"						
Score	1	2	3	4	5	6
%	10	23	33	23	10	0
Mean: 3						

Hypothesis 3-3 investigated perceived skills and knowledge available. As Table 8 shows, the assessment of the own organization's capability was generally carefully positive. This means that, overall, municipalities think positively of their capabilities to implement benefits management.

Table 8. Results for Hypothesis 3-3

H3-3: Norwegian public agencies lack the competence that is necessary to successfully realize benefits from ICT-projects.						
"Practical work with benefits management works best if you involve key individuals from different fields in the organization"						
Score	1	2	3	4	5	6
%	3	3	3	30	23	37
Mean: 4.8						
"My organization has generally good competence in defining effects of ICT projects"						
Score	1	2	3	4	5	6
%	3	10	14	62	7	3
Mean 3.7						
"My organization has generally good competence in following up effects of ICT projects so that they can be realized"						
Score	1	2	3	4	5	6
%	3	7	24	48	14	3
Mean: 3.7						

Overall these results paint a slightly more positive picture than we hypothesized. The agencies' limited experience with this kind of approach would suggest that BM would not immediately be embraced in relation to eGovernment; but here it was very well received. Another finding which could be positively interpreted is that contrary to our expectations we found no statistical significance for any background variables we used (municipality size, project type, and sector) as concerns satisfaction with the project. Because these variables are typically considered important for the outcome of eGovernment projects we expected that as benefits management requires both professional skill, available municipal data and resources to measure both baseline and outcomes larger municipalities, engineering-type projects and scale advantages (more common in national government sector than in municipalities) might make a difference, but here it did not. One reason for the positive responses might be that many of the questions concern improvements rather than actual measures, and the size of improvements is of course not necessarily related to baseline values. The positive interpretation of this is that the structured work methods of a benefits management approach are applicable with positive results in municipalities of all sizes. We did find one statistically significant correlation, however, namely between size of municipality and likelihood that they would use a BM approach again (sig = .006). This is a very strong correlation. We also found a situation close to significance (sig = .07) on the question if they would use this particular method again. These correlations suggest that, despite the generally positive replies from most, indeed size matters. While applicable everywhere, it seems making the efforts involved with BM appears less deterring in larger municipalities.

There are a few limitations to our study. For instance, the quantitative nature of the study limits our ability to investigate the project managers' competences related to BM. A shallow understanding of BM as e.g. an advanced approach to cost benefit calculations could render different results from a deeper understanding of BM as a managerial process approach running from idea to implementation and use. Further,

as mentioned earlier, our study is based entirely on self assessments. It is possible that qualitative research approaches like interviews or observations could have yielded different results in terms of the actual usefulness of BM as well as the agencies' readiness to adopt BM practices. Finally, our study is limited to investigating the project managers perceptions of BM. Equally interesting would be to study the perceptions of other stakeholders like e.g. the project owners. Further research could address these issues to ensure a broader understanding of issues related to BM adoption in public agencies.

5   Conclusion

In summary, we found project managers more positive towards, and organizations – as self-assessed – more prepared for BM than we thought. Roughly 80 % of the managers considered their early quantifications of expected benefits to be realistic also in retrospect, while some 20 % report their early estimates as being too high. Further, the project managers found the approach useful, and although it was hard to specify benefits they were after all generally able to do that quite well, as of their own estimate. They felt projects became more focused, and they expect to continue working with a benefits management approach. There was, however a statistically significant correlation between size of municipality and the inclination to go on – larger municipalities were more positive. While keeping in mind that the benefits that were identified and quantified in the reported projects represent estimates and not measurements, this study shows that benefits management can be useful – and even welcomed - in eGovernment projects and that demonstrating benefits from such projects can be accomplished.

This research has been focusing on BM projects; once projects are completed further research is necessary to learn if and how the BM approach is implemented in the organization as a regular tool. This will require establishing agreed benefits variables, as well as data collection routines and agreed measures from these. Therefore, our future research will in two consecutive steps investigate project owners' views as well as methods implemented and actual effects achieved.

Acknowledgements

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Pre-determinants of Implementing IT Benefits Management in Norwegian Municipalities: Cultivate the Context

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Abstract. The concept of benefits management addresses explicated practices to realize benefits from information technology investments. However, a minority of organizations have implemented those. We explored which pre-determinants affect the implementation of benefits management practices by conducting a Delphi process in the Norwegian municipality sector. The experts represented governmental organs, general management, and municipal service managers. They identified 59 pre-determinants of potential importance. However, the experts reached no significant consensus on the relative importance of the pre-determinants. Instead, we suggest that the identified pre-determinants should be holistically and contextually scrutinized. As a basis for that, we categorized the pre-determinants further into the areas of *government-level policy*, *municipality-level policy*, *benefits management process*, and *benefits management toolbox of methods and techniques*. Our study highlights areas of explicated managerial policies and actions in the municipal and inter-municipal contexts, in addition to the task of finding out a set of useful practices as such.

Keywords: Benefits management, benefits realization, IT investment, municipality.

1 Introduction

The public sector meets great challenges, as well as lucrative opportunities, of modernizing governmental services and operations in the digital era. New digital services require significant investments in information technology (IT) and, moreover, simultaneous organizational change to realize benefits from the IT investments.

The issue of benefit realization [1], a.k.a. benefit capture [2], posits a challenge both in the industry and the public sector [3]. Despite of technological information systems (IS) solutions delivered to organizations, the organizational and societal impacts often remain only partially realized [2]. The challenges of benefits realization start from the beginning of IT/IS projects. Many organizations have difficulties to pre-define and anticipate the benefits, at least all of them [1, 4]. Moreover, even in cases where expected benefits are defined beforehand, little attention may be paid in the

post-implementation stage, after the initial justification of IT/IS projects to ensure the funding has succeeded [1]. And, even if conducted, post-implementation reviews often focus on technical conformance, project management effectiveness, and other easily quantifiable issues, whereas the actual benefits delivery to the organization remains less explicitly measured [4, 5].

As a response to these challenges, a number of frameworks and methods for *benefits management* have been suggested [3, 6, 7]. Benefits management is defined as "*(t)he process of organizing and managing such that the potential benefits arising from the use of IS/IT are actually realized*" [3, p. 36]. The concept highlights that in addition to investment justification and evaluation *per se*, it is necessary to establish an explicit process to ensure that IS development initiatives actually deliver the initially proposed, as well as emerging, benefits [1]. Despite a few efforts of developing methods and tools for the field [3] research in general shows that methodologies covering the full process of benefits management have not become extremely spread in practice [4, 5]. The stated desirability of benefits management in the first place is, at best, grounded on anecdotal mentions referring to an unspecified number of case studies [3, 7]. However, based on experiences from organizations which practice benefits management, it is claimed that it helps avoid the loss of clearly achievable benefits, identify and realize more extensive benefits, reduce IT costs for some investments, cancel or re-direct projects with no benefits in sight [7], identify essential IT functionality with regard to organizational goals, and reduce the amount of IT functionality focusing on the core required to realize the benefits [3, p. 103].

The benefits management literature has varying ideas about the actual stakeholders and owners of the benefits management process. Bennington and Baccarini regard project managers as the owners [5], whereas Ward and Daniel indicate that benefits management at best involves strategic alignment and development programs beyond the scope of particular IT projects [3]. Finally, Kohli and Devaraj suggest a broad involvement of various managerial stakeholders into the process in large organizations [7].

In the Norwegian public sector, Kommunenes Sentralforbundet (KS), a central organ for municipalities, has set a goal that in 2008 every municipality should document that their IT projects have actually resulted in better services, more effective operations and resource savings [8]. For this purpose, KS started actions in 2006 to facilitate adoption of methods and tools for benefits management and realization in the municipalities. However, the practices of benefits management implemented in the public sector remain little validated beyond a few case studies, in which the researchers have already actually started with their particular conceptual agenda for benefits management (e.g. [3]).

In this paper, we explore pre-determinants of adoption and implementation of benefits management in Norwegian municipalities. Especially, we examine issues, which would facilitate the implementation of systematic benefits management practices, as it has remained to be a challenging issue. On the other hand, perhaps unlike in the private sector, the municipalities within one country form a targeted domain within which the research and development results can be openly shared and utilized. Hence, it forms an attractive research opportunity and the results may have direct implications and effects within the network of already interested governmental organizations.

The structure of the paper is as follows. Section 2 summarizes the research process and section 3 the results. Section 4 outlines implications for practitioners and researchers with a brief description of the shortcomings of our study, before a conclusion in section 5.

2   Research Process

As the focus of our research was oriented towards the future to predict the relevant pre-determinants for benefits management implementation, we chose to start the research with the Delphi method [9, 10]. A Delphi study is suitable for forming a many-sided, consensual, expert opinion on a complex problem area, from which little empirical data is otherwise readily available [9, 10]. The experts were selected from a number of municipalities and from the central governmental organizations related to governance of municipal development in Norway. The experts which were available for our study were divided further into three panels: the central government representatives (4 members), chief officers ("rådman", in Norwegian) and vice chief officers of the municipalities (5 members), and operative management of varying professional services in the municipalities (10 members). The members of the latter two panels came from municipalities of varying sizes and geographical locations within the country. The operational managers represented varying branches of municipal services, such as health care, school, technical services, and IT management. In each panel, the experts had long professional experience from the municipal domain of e-government in general and his or her job in particular. While they may have less expertise on particular benefits management approaches or methodologies, they represent a relevant view of Norwegian municipalities concerning the municipal benefits management practices for the future. In this regard, we believe that they represent a realistic sample of the municipalities which are about to face the request to adopt and implement systematic practices for benefits management concerning their IT investments. However, as the experts were recruited from a benefits management seminar, we can regard them perhaps as more interested in the field by default than the managers not attending such seminars.

The first phase of the Delphi study was brainstorming. Each expert produced individually a list of minimum 6 issues s/he regarded as an important pre-requisite or challenge for adopting an explicitly defined benefit management practice for IT investments in the municipalities. This phase resulted in 23 A4-pages of textual narratives declaring the issues and giving a free-text reasoning for them. After gathering the issues from the participants, the researchers unified the list of issues, removed exact duplicates and unified the terminology used. The consolidated list was sent back to the experts, who then gave feedback to validate that the researchers had not dropped out any issue of theirs and that the researchers had not misinterpreted or changed meanings of any issue defined by an expert. In this phase, the consolidated list comprised 59 unique issues suggested by the experts.

The second round narrowed down the brainstormed list to a smaller number of the most important issues. Now, we divided the experts into the three panels described above. In each panel, the experts defined max 20 issues that they regarded as "most important". In this phase, panel A involved 5 members, panel B 7 members and panel

Table 1. The Most Important 50% of the Issues Chosen and Ranked by the Panels

Panel A (n=5, W = 0,219)		Panel B (n=7, W = 0,161)		Panel C (n=11, W = 0,295)	
Issue	mean	Issue	mean	Issue	mean
1. Requirement from management (Context)	3,0	1. Easy to use (Method)	5,7	1. Easy to use (Method)	3,1
2. Employee participation (Process)	6,7	2. Straightforwardly understandable results (Method)	7,0	2. Goal clarity (Method)	4,3
2. Clear responsibilities for realization (Process)	6,7	3. Embedded part of change management practice (Process)	8,2	3. Straightforwardly understandable results (Method)	5,4
4. Easy to use (Method)	7,0	4. Both quantitative and qualitative benefits included (Method)	8,4	3. Broad participation (mgmt and employees) (Process)	5,4
5. Method usability across professions (Method)	7,3	5. Easy to learn (Method)	9,5	5. Saleability (Method)	6,2
6. Process analysis (Method)	7,5	6. Goal clarity (Method)	9,6	6. Measurable parametres (Method)	6,7
7. Realistic, clear effect realization expectations for org. units (Context)	8,0	7. Resource-efficiency of the method (Method)	10,0	7. Both quantitative and qualitative benefits included (Method)	7,4
8. Goal clarity (Method)	8,3	8. Saleability (Method)	10,1	8. Embedded part of change management practice (Process)	7,6
9. Exemplary business cases (Method)	9,0	9. Method usability across professions (Method)	10,7	9. Method should make benefits for everyday operations visible (Method)	7,9
9. Decision support for politicians (Process)	9,0	10. Requirement from management (Municipal context)	11,3	10. Short and long-term benefits (Method)	8,1
11.Templates for benefit calculations (Method)	9,3	11. Operational-level incentinves for benefit creation (Context)	11,8	11. Clear responsibilities for realization (Process)	9,3
12. Benefits for the public (Method)	9,7	12. Measurable parametres (Method)	11,9	12. Method usability across professions (Method)	9,3
13. Exchange of competence (Inter-municipal context)	10,0	13. Need for a new investment documented ex ante (Process)	12,0	13. Realistic, clear effect expectations for org. units (Context)	10,5
14. Straightforwardly understandable results (Method)	10,8	14. Clear responsibilities for realization (Process)	12,6		
15. Support for benefit documentation (Method)	11,5	15. Applicability of the method beyond IT (Method)	12,7		
16. Organizational incentives for benefit creation (National context)	12,2	16. Support for benefit documentation (Method)	12,8		
		17. Broad participation (mgmt and employees) (Process)	13,0		
		18. Decision support for politicians (Process)	13,7		
		19. Coverage over the whole project life-cycle (Process)	13,9		
		20. Templates for benefit calculations (Method)	14,2		
		21. Method should make benefits for everyday operations visible (Method)	15,3		
		22. Scalability for municipalities of different size (Inter-municipal context, method)	15,5		

C 11 members, as a couple of additional members expressed their interest in contributing to the first voting phase. The presentation order of these factors was randomized for the panel members to avoid bias related e.g. towards choosing factors from the top of the list. For each distinct panel, the factors selected by more than 50% of the experts were retained for the next phase. The factors are listed in table 1. The next phase involved ranking of the issues, shown in table 1. After this phase the major part of our respondents indicated that they did not regard further ranking as relevant and we needed to stop the process. The results indicate that each panel was far from the limit value of significant consensus about the most important issues (Kendall's W should have been > 0,7 [11]) and we thus found no statistically significant relative order of importance for the issues found. This led us to continue anyhow towards theory-building from the brainstorming results as we believe that they represent a useful account of expertise to be conceptualized towards a more holistic idea about how to facilitate future method adoption for benefits management.

3   Results

3.1   A Delphi Study without Consensus

Table 1 summarizes the issues identified as most important by more than 50 % of the panel members and ranked by each panel. As mentioned above, however, the ranking cannot be taken as a statistically significant prioritization of the issues. (The whole consolidated list of the 59 initially identified issues can be seen in [12]).

   The concept of benefits management of IT investments is an elaboration of the established tradition on IS investment evaluation research [3]. Serafeimidis and Smithson [13], building upon Pettigrew's work on change management [14], divided the phenomenon of information systems evaluation to include the *context*, *content*, and *process* issues. The contextual issues focus on the environmental aspects, or pressures inside and from outside the organization in question, which mostly determine why evaluation is adopted and practiced in the first place and who should be doing it [13]. The evaluation content answers to the question of what is to be evaluated including the evaluation criteria and measures embodied in the benefits management method, whereas the process of IS evaluation focuses on how the evaluation process is conducted (including the concrete process guidelines and instructions for conducting the evaluation tasks) [13]. These dimensions formed the theoretical basis for our subsequent grouping of the benefits management issues to be discussed below.

   First, the prioritization (Table 1) seemed to focus on the method and process-related issues. However, after the first prioritization round the most panel members quit the further process. According to a few answers to our inquiries, they regarded further ranking efforts as a less meaningful way to produce results useful for them. Hence, the actual ordering of the ranked issues remained relatively insignificant. This led us to take a step back and analyze the qualitative data from the brainstorming phase again.

3.2   Qualitative Analysis of the Brainstorming Data

We started the qualitative analysis by trying to divide the data into the context-, content-, and process-related issues [13]. Whereas our first impression was that the method- and process-related issues were highlighted to a great extent during the first round of prioritization, the deeper analysis revealed a good number of context-related issues, which were mentioned by many experts. Moreover, we found that there were two levels of context which related to the domain of municipal IT-investments: the national (inter-municipal) context and the context of a particular municipality. Figure 1 summarizes the results of our analysis, which involves all the mentioned issues from the brainstorming phase divided into four final categories: *government-level policy for enhancing benefits management*, *municipality-level policy for enhancing benefits management*, *toolbox of methods and techniques for benefits management*, and *process organizing for benefits management* (Figure 1). These need to be in place to facilitate adoption and implementation of benefits management practices in Norwegian municipalities. Hence, these categories altogether form the pre-determinants of implementing municipal benefits management.

Government-Level Policy for Enhancing Benefits Management. To enhance benefits management in municipalities, a government-level policy needs to be created. The policy should involve elements of *awareness creation*, make benefits management an *explicit requirement*, provide *incentives*, facilitate *knowledge sharing* among the municipalities, and create a *common and fair culture* for handling with the consequences and impacts from the investments (Figure 1).

Lack of awareness and interest in the benefits management concept in general was seen as a challenge. *"Create a greater common interest for this."* (Expert 5, national govt. organization, all the data citations translated from Norwegian). Moreover, the government should be aware of the governmental areas where greatest benefits would be gained, and guideline the municipal IT investment policy accordingly. *"There are probably sectors where it is easier to realize benefits compared to some others."* (Expert 6, national govt. organization).

A few government-level and municipality experts suggested that there should be a general-level and explicit policy requirement for effectiveness in the public IT investments, perhaps even as a pre-determinant to get money from the central government. *"Show that benefits realization is a national area of interest and that economical means provided for externally funded projects require this to be done explicitly."* (Expert 3, Vice chief officer).

According to one informant, inter-municipal investments should be enhanced through government-level funding. However, in addition to requirements, also incentives for doing benefits management provided by the central government need to be established. *"The state has to be clear that the benefits from increased efficiency and effectiveness resulting from IT should stay in the municipalities and not, e.g., be used to reduce the budget framework."* (Expert 15, Chief officer).

The government needs to agree with the labour unions with regard to preparing for consequences from the change projects and creating a fair culture for this purpose, *"better co-operation with labour unions concerning the tasks which vanish and redundant human resources."* (Expert 5, govt. organization). Finally, knowledge of
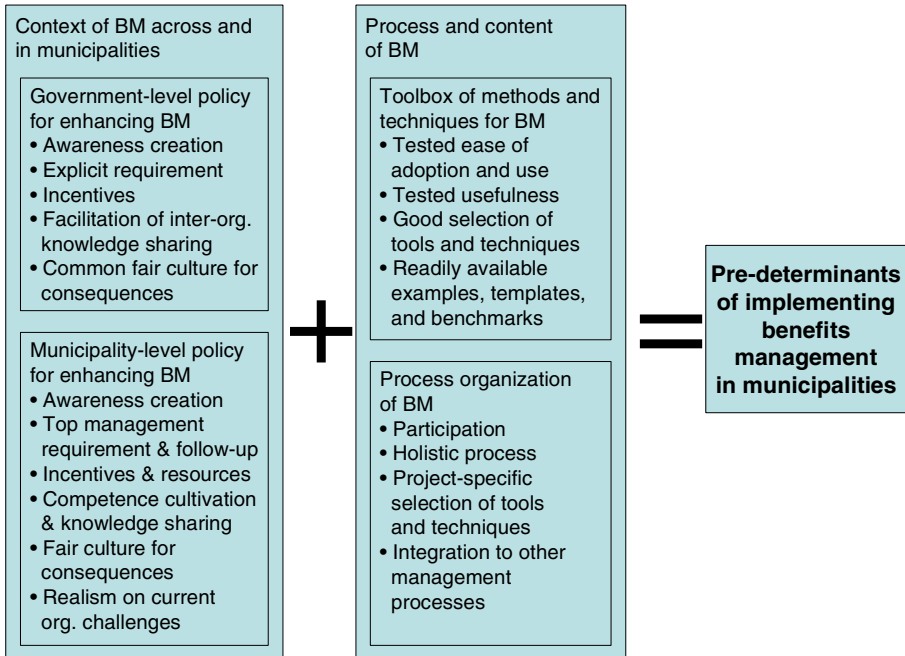
Context of BM across and in municipalities		Process and content of BM

Context of BM across and in municipalities

Government-level policy for enhancing BM
- Awareness creation
- Explicit requirement
- Incentives
- Facilitation of inter-org. knowledge sharing
- Common fair culture for consequences

Municipality-level policy for enhancing BM
- Awareness creation
- Top management requirement & follow-up
- Incentives & resources
- Competence cultivation & knowledge sharing
- Fair culture for consequences
- Realism on current org. challenges

+

Process and content of BM

Toolbox of methods and techniques for BM
- Tested ease of adoption and use
- Tested usefulness
- Good selection of tools and techniques
- Readily available examples, templates, and benchmarks

Process organization of BM
- Participation
- Holistic process
- Project-specific selection of tools and techniques
- Integration to other management processes

=

Pre-determinants of implementing benefits management in municipalities

Fig. 1. Pre-determinants of Implementing Benefits Management in Norwegian Municipalities

benefits management including methods and examples from good projects must be shared inter-organizationally; *"expertise exchange and competence transfer from successful projects, which can show good results."* (Expert 11, Manager).

Municipality-Level Policy for Enhancing Benefits Management. Any municipality needs as well to cultivate its own context internally to be ready for benefits management through an explicated policy. The issues include *awareness creation*, *top management requirement and follow-up*, *incentives and resources*, *competence and knowledge cultivation*, *fair culture for consequences*, and *realism on current organizational challenges* (Figure 1).

The top managers, professional leaders, and eventually municipal politicians should be aware of the concept and rationale of benefits management. Moreover, they need to be convinced with concrete examples that adoption of explicit benefits realization practices actually results in increased benefits. Thirdly, the managers should be made aware of existence of a common method and set of guidelines for doing the job. *"Top management need to want it… Politicians need as well to want it and to see the value of it."* (Expert 10, Manager). *"A method has to exist."* (Expert 1, Vice chief officer).

In addition to state-level requirement, the explicit requirement for benefits realization and follow-up of IT investments by municipal top management was highlighted as well. *"The political and administrative leaders should require a cost-benefits analysis from everyone who wishes resources for new IT investments."* (Expert 1, Vice chief officer).

Again, also incentives within a municipality are needed to implement benefits realization. *"Each participant need an experience that it is good to create benefits, but simultaneously the process should create benefits for oneself, too. This creates ownership."* (Expert 13, Chief officer). Moreover, there should be enough time and resources to conduct benefits management. *"There needs to be enough time and focus to work with the process"* (Expert 10, Manager).

A great many highlighted that municipalities need to create and cultivate competence on and knowledge of a number of issues including: benefits management and change management methods and techniques, IT potentiality for facilitating effectiveness and efficiency gains in general, needs for prioritizations, and experiences from previously successful projects. *"Knowledge creation among top- and middle-managers."* (Expert 10, Manager). *"The political and administrative leaders need have a clear insight that certain types of IT investments are only 'nice to have' while producing little benefits for the organization, still creating extra costs."* (Expert 1, Vice chief officer).

The informants highlighted also a need for organizational culture in municipalities to handle consequences of benefits realization fairly to reduce human fear for losing jobs and change resistance in the organization. *"It is important to get the union stewards involved in the process as early as possible. This creates a safe atmosphere in the organization."* (Expert 19, Manager). Finally, the informants denoted a need for a realistic policy with regard to expectations towards the task. For example, it may be difficult to start with base-line analyses concerning working time estimates of current processes. Moreover, different professions inside a municipality may have conflicts which may hinder co-operation in relation to IT.

Organizing the Benefits Management Process. The informants addressed four issues related to organizing the benefits management process: *participation*, *holistic coverage of the process*, *project-specific selection of the tools and techniques*, and *integration of benefits management to other management processes*.

With regard to participation, most informants highlighted a need for involving the management and employees. Fewer mentioned involvement of politicians. Citizen involvement was not at all mentioned as a factor to facilitate adoption of benefits management. Especially, the process should involve people responsible for the operational areas touched by the investment. *"Employees need to be involved. Without them contributing to adoption of new ways-of-working, there are no benefits to harvest."* (Expert 10, Manager).

The process should truly be going holistically on before, during, and after the actual IT project. *"Experiences from the impacts need to be measured as well."* (Expert 12, Manager). *"An issue we have not been good is the aftermath evaluation. We take out the [calculated] economical benefits as budget reductions, but are we sure that we really get the estimated time-savings, or are these hidden in costs other than the salaries?"* (Expert 17, Manager).

The process should include a phase in which tools for each particular project at hand are selected in more detail, as every project doesn't pursue similar benefits. Moreover, the process should be integrated to existing management processes, such as project management and change management. *"Form the method so that it becomes a*

natural part of the general-level everyday work around organizational development and change processes." (Expert 3, Vice chief officer).

Requirements for Methods and Techniques. Finally, the informants addressed a great many issues related to the benefits management methods and techniques, i.e., the content of benefit realization. Firstly, the *pre-conceptions of the accessibility, ease-of-use, and usefulness of the methods and techniques* need to be well-received. Secondly, the method should include a *wide selection of measures and techniques* to choose from. Thirdly, the method toolbox should include a set of *exemplary cases and benchmarks* which to imitate.

In order to adopt a common toolbox of methods and techniques, the stakeholders of benefits management should share a number of positive preconceptions of it. The methods should be pre-tested to be easy to access, adopt, and understand, and their use should be smooth, without much need for resources, especially without external consulting resources. *"The method, process, etc. need to have a 'profile', which makes it easy to sell to the managers – to show that it can give results with limited resources."* (Expert 3, Vice chief officer). *"It is essential that the method does not require too much use of resources and time."* (Expert 14, Manager). *"The method should be easy to access, not 25 clicks and a lot of searches and time-consuming downloads away… It should use a terminology understood by the users, it should be in Norwegian."* (Expert 7, Manager).

A good number of detailed issues related to the desirable content and range of particular tools and techniques. A conclusion can be drawn that the "toolbox" should contain altogether a many-sided set of possibilities for benefits identification and evaluation, in connection to the management actions. A few informants focused solely on listing specific content they wished the method should include, in order to use it. In general, the method should orientate towards realism with regard to ideas of expected benefits. Some informants wanted the focus to reside solely in the effectiveness and efficiency issues, whereas others wished also to include analysis of "softer" benefits. *"The models should document… not only economics, but also quality, user satisfaction, employee satisfaction…"* (Expert 11, Manager). The method should include means to understand new ways-of-working, process modelling, risk analysis, cost-benefit analysis, identification of quality problems, both long-term and short-term benefits etc. *The important factors are… process modelling of current situation and its time-estimates, …and time-estimates of the new process."* (Expert 17, Manager). Two experts mentioned that the method should prepare alternative benefits scenarios to aid decision making among top management and politicians.

Finally, the toolbox for benefits management and realization should readily include examples, models and benchmarks from other municipalities concerning how and what kind of benefits can be actually identified, calculated and realized from certain types of IT projects. The toolbox should also include templates and models for benefits identification and calculation. Moreover, it should give instructions of how projects should be followed by managers to realize the goals. *"Access to good examples of how to follow the projects until realization of goals can be important."* (Expert 6, govt. organization).

4 Discussion

The non-consensus and the subsequent lack of motivation among the expert participants to seek for a greater consensus changed our study plans. However, we got valuable insight into the issues in general by noticing that there perhaps exists no straightforwardly shared set of the "most important" pre-determinants of implementing benefits management practices in Norwegian municipalities. Rather, our results, organized under the four broad categories of issues, altogether suggest a set of issues which need to be discussed at the national and municipal levels before methodical practices for benefits management of IT investments will be adopted. In the following, we suggest implications for practice and further research evoked by the results.

4.1 Implications for Municipal Benefits Management Practice

Compared to the usual company-level strategic focus of benefits management [3], the national government-level context forms another element of policy formation, which we regard as a potentially specific characteristic for the municipal sector of e-government. Existence of national coordination organs provides an opportunity to create a national virtual community of practice to create awareness of benefits management, to deliver governmental requirements and incentives to municipalities, to document and dynamically elaborate a well-covering method toolbox, and to exchange experiences between pioneering municipal projects and thus to build positive preconceptions about individual benefits management techniques. Here, based on our understanding of existing studies on how benefits management or investment evaluation techniques have not been widely adopted, we argue that this job should be jointly driven by practitioners and academics. Academic research alone can hardly penetrate the method knowledge or case experiences quickly enough in relation to the national strategy of KS. There exist 434 municipalities in Norway, with largely overlapping needs and interests for IT investments and benefits realization from them. Hence, there most likely exists a potential group of municipal champions who might be willing to both get knowledge from others and share their own knowledge to other municipalities in order to be able to utilize the available exemplary cases and to avoid redundant efforts where possible.

Another observation based on our qualitative analysis of the brainstorming results was the emergence of the context-related issues, while the method- and process-oriented issues had dominated the first prioritization round. The existing prominent literature on benefits management has largely focused on methods and processes [3, 6, 7]. Having a generic method, process, or even an implemented toolbox for benefits management, however, may alone fall short without explicit policies at the national level as well as in each municipality. Whereas the ''eKommune 2009'' statement [8] provides the first guidelines at the national level, our study now gives a basis to reflect such policy documents in light of the collected expert opinion including the five issues (creating awareness, explicit requirement for benefits management, incentives, facilitation of knowledge exchange, and creating a fair culture for benefit sharing). Moreover, our results provide six policy issues to be discussed and solved at the level of individual municipalities as well.

In addition, the results give practical guidelines for implementers and developers of a method toolbox and provide guidelines for organizing benefits management processes in municipalities. Especially, the experts indicate that a method toolbox should provide already "tested" methods and practices. Furthermore, it should include concrete examples against which to benchmark and which to imitate. Moreover, it should still include a covering set of methods and techniques from which to select appropriate ones for particular types of investments. These issues would benefit from an external stakeholder, who would be interested in facilitating and coordinating the elaboration and education processes of the IT benefits management practices across municipalities.

4.2   Implications for Benefits Management Research in Municipalities

The nation-level context of benefits realization from municipal IT investments represents an additional level of context to coordinate the work across the municipalities, if compared to strategic benefits management efforts in individual organizations. Furthermore, the Norwegian municipal context of benefits management may also differ from the business organizations – despite that Ward and Daniel [3] regard benefits management as rather similar in both the private and the public sectors. Especially, the security of jobs was highlighted as a major context-related pre-determinant for adopting a benefits realization process. In addition to guaranteeing the safety of jobs, the urge for creating a fair benefits sharing culture may be perhaps more prominent in the public sector, where the municipalities are used to the public budgets steering their operations (instead of the market-oriented mechanisms). However, accountability towards the public got practically no attention as a prerequisite for implementing and elaborating municipal benefits management practices. An interesting avenue for future research would be whether an employee-safety-centred benefits management approach is able to produce benefits for all stakeholders of eGovernment, including the public. Such research should perhaps focus on international benchmarks of eGovernment indicators, which could then be reflected in light of the policy issues driving the benefits realization practices in each national context.

Another stream of research, which should perhaps be even more closely connected to practice, concerns the demand for proving the perceived usefulness and usability of the method toolbox elements. That is, we need to study the very issue of how beneficial benefits management would be in itself with regard to the resources used [3]? Such judgments about benefits management methods in the municipal context cannot be done without some pioneering projects willing to try some methods out without being straightforwardly sure about their usefulness and usability. Only after some documented experience those method elements can be "sold" further to similar cases in other municipalities with (to some extent) grounded statements about their perceived usefulness and usability. To study this issue, we plan for a series of action research efforts in which volunteer pioneering municipalities will adopt and use a set of selected benefits management methods and techniques, whereas the researchers collect data about how the methods are received and experienced. Of course, an inter-municipal community of practice would help also in this regard, taken that we could establish an active sub-community of method developers exchanging

their experiences also directly without a need for going always through the researcher-guarded communication channels alone.

4.3 Shortcomings

Our aim was initially to build a consensus on a few most important prerequisites for adoption of benefit management practices. Instead of such consensus, the panels provided a good number of 59 issues while failing in their consensual prioritization. As we interpreted this to indicate that a number of prerequisites may be important to co-exist unpredictably and simultaneously, such an interpretation should be validated and clarified further by additional data collection. Extending qualitative data collection beyond 20 informants may perhaps reveal additional prerequisites. However, during the analysis the last 2 or 3 interviews produced little new insight to be added to the first 17 or 18. This may indicate that we may be close to get the data "saturated" [15] at least with regard to the four major issue categories in general.

The brainstorming data, which aimed at identifying individual pre-determinants, gives little basis to suggest cause-effect relationships, i.e., to do axial coding [15], between the particular issues (although one may be tempted to do so while looking at the issues in Figure 1.). For this purpose, a more detailed qualitative study may be needed. However, our study can be used as a basic set of categories, which can be used as a basis for further examination.

This study has been solely conducted in the Norwegian context of public administration. Hence, generalizations from the lessons learned should be drawn with care. A few of the pre-determinants might well be specific to the local traditions, values, and ideas of public administration. However, we suggest that the results might be also of interest for the municipal sectors in other countries which have national organizations to coordinate and facilitate benefits realization from public e-government investments together with a structure of relatively independent municipalities with regard to their investment decisions.

5   Conclusion

Our research identified a set of pre-determinants which would facilitate implementation of IT benefits management practices in Norwegian municipalities. The pre-determinants relate to four categories of issues: government-level policies and actions for enhancing benefits management, municipality-level policies and actions for enhancing benefits management, a toolbox of methods and techniques for benefits management, and process organization for benefits management. The previous literature has focused mainly on the method content and process-related issues of how to conduct benefits management. In addition to identifying importance of those also in the municipality sector, our research contributes by identifying a set of contextual issues at the governmental and municipal levels, which may have a role in the adoption and implementation of benefits management practices.

In practice, we suggest a check of the national policy for benefits management in light of this study, development of municipal benefits management policies involving the above-suggested issues by the experts, and facilitation of a virtual community of

practice for exchanging knowledge and experiences effectively across municipalities. Our further research will focus on studying and documenting the usefulness and usability of a set of benefits management practices in the municipal contexts and examining how beneficial the idea of benefits management in itself would be in light of some meaningful measures to be developed.

Acknowledgement

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Evaluation of ICT Investments in Public Administrations Based on Business Process Models

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Abstract. Within the public sector domain there is great potential for business process optimization through ICT. However, until today these possibilities remain largely unexploited. To measure the impact of ICT-investments all processes of a public administration have to be taken into account. The PICTURE modelling method has been proposed as a way to efficiently model the whole process landscape of a public administration. Based on the processes captured, the impact of certain ICT functionalities can be analyzed. ICT investment decisions become more transparent towards the political leadership which are the decision makers in the public sector. This paper has two research objectives: First, an architecture for an semi-automated evaluation of ICT investment decisions is introduced. Second, the practical feasibility of the architecture is shown based on an investment decision for a document management system.

Keywords: E-Government, Public Administration, Process Landscape, ICT Investment, Decision Support.

1 ICT Investments in Public Administrations

Process reorganization and optimization through ICT bears great potential for public administrations (PA) [1, 2] in Europe. Infrastructure oriented software products like workflow management systems (WFMS), document management systems (DMS), or optical archives (OA) play a particular important role in this context. These systems have been established as good solutions for back-office reorganization because of their impact on multiple business processes.

Especially in PAs these potentials remain largely unexploited due to missing transparency. Municipal administrations often hesitate to invest into new or bigger ICT components. Due to this missing transparency ICT investment decisions cannot be justified towards the political leadership and the public. Therefore, often only few processes which are easy to assess are reorganized [3].

The full impact of ICT investments can only be assessed when considering the complete process landscape of a PA [4]. For example a DMS is not only able to support the process "handle building application" but also the processes "handle application to run a restaurant" or "handle application for housing allowance". Therefore, all of these processes should be taken into account, when deciding on ICT investments. To consider the process landscape of a PA means to refer to its complete set of processes.

Transparency about the process landscape can be achieved by using the PICTURE modelling approach. The PICTURE-method is a domain specific approach [5-8] designed for process modelling [9, 10] in PAs. It enables capturing the whole process landscape by fixing the level of detail of the models [11]. This is important due to the various potential contributors to models in PAs [12]. The PICTURE-method is easy to understand and it enables the involvement of employees of a PA into the modelling process. This allows for an efficient acquisition of a large number of processes. PICTURE has been chosen in this paper as it is to our best knowledge the only PA-specific modelling approach that focuses on the representation of the entire process landscape [13].

The contribution of this article is to present an architecture for a semi-automated evaluation of ICT investments. Basis for this analysis are PICTURE process models. These models explicate the implicit knowledge [14, 15] about the process landscape and, therefore, provide the information needed to assess the impact of ICT-investments on the processes. By using the whole processes landscape as foundation for the analysis, investments decisions become more transparent and justifiable.

The reminder of the paper proceeds as follows: The second chapter outlines the core elements of the PICTURE modelling language. Chapter three describes the architecture of the ICT investment evaluation approach. It explains how the impact of ICT investments can be evaluated on the basis of PICTURE process models. The fourth chapter presents an implementation of the evaluation methodology and illustrates its application. The paper concludes with a summary of its core contributions and an outlook to future research areas.

2   The PICTURE Process Modelling Approach

PICTURE is a domain specific modelling method with a corresponding web-based tool. The PICTURE-approach consists of two core components: The *process landscaping module* and a *reporting framework*. In section 3 the support of ICT investments decisions by the reporting framework is described. In the following the process landscaping module with the PICTURE modelling language is presented.

The two fundamental constructs of the PICTURE modelling language are process building blocks and attributes. Additional constructs that rest upon these basic ones are processes, sub-processes, variants, and anchors. To structure the different elements, the PICTURE-language distinguishes different views on the process landscape.

Views: Like many other process modelling approaches PICTURE uses views in order to handle and effectively reduce complexity. PICTURE consists of four different views (Fig. 1):
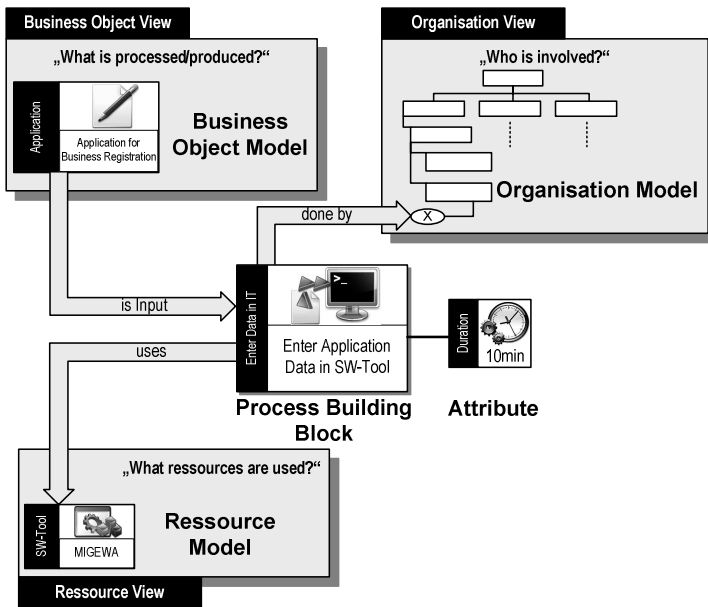
Fig. 1. Views, Building Blocks, and Attributes within the PICTURE-Method

- Process View ("How is a service delivered?")
- Business Object View ("What is processed/produced?")
- Organization View ("Who is involved in the modelling process?")
- Resource View ("What resources are used?").

Process Building Blocks: A main construct of the PICTURE modelling language are *process building blocks (PBB) [16].* A PBB represents a certain set of activities within an administrative process. The name of a PBB is taken from the vocabulary of the PA domain [17]. PBBs are atomic, have a specific level of abstraction, and are semantically defined by a domain concept. Therefore, in an analysis of the models problems like *naming conflicts* [18] are avoided. As the type of the PBB defines the semantics of the model element such conflicts do not occur. Examples for PBBs are "Incoming Document", "Formal Assessment", "Enter Data in IT", or "Archive Document". PBBs belong to the process view.

Attributes: Additional facts about the processes can be collected with the help of *attributes* assigned to the PBBs. These attributes specify the properties of the corresponding building blocks in detail. For example, an attribute of the PBB "Enter Data into IT" is "Duration". Attributes provide the core information for the subsequent process analysis. They establish a connection from the central process view to the business object, organization, and resource view.

Processes: A process performs a certain administrative service. In PICTURE processes are represented as a sequential flow of PBBs. A process can further be described by attributes. It can be connected to organizational units or employees.

Sub-Processes: Many processes are quite complex and run through several different organizational units. In order to simplify the modelling of processes the concept of sub-process is introduced. A sub-process in PICTURE is defined as a part of a process that is covered by only one employee.

Variants: As modelling with the PICTURE-language is strictly sequential a construct is needed to describe contextually important ramifications in the process flow. For that purpose PICTURE offers two possibilities: On the one hand attributes can be used to specify different cases with percentage values, e.g. for different contact channels (mail, email, phone, or personal). On the other hand it is possible to specify process variants. A *process variant* defines an alternative sequence within a sub-process. The frequency of a variant is captured by percentage values.

Anchor: An anchor allows for establishing connections between PBBs in different sub-processes and variants. For example the PBB "Outgoing Document" from variant A in sub-process II can be connected to the PBB "Incoming Document" from sub-process III. The exchanged document is for example a change request. In this case an anchor is established between the two corresponding PBBs. Thus, the anchor connects different sub-processes to form a process. Fig. 2 shows how processes, sub-processes, variants, and anchors work together.

With the PICTURE-language similar activities are modelled by the same type of PBB. The PBBs limit the degree of freedom during modelling. This leads to reduced
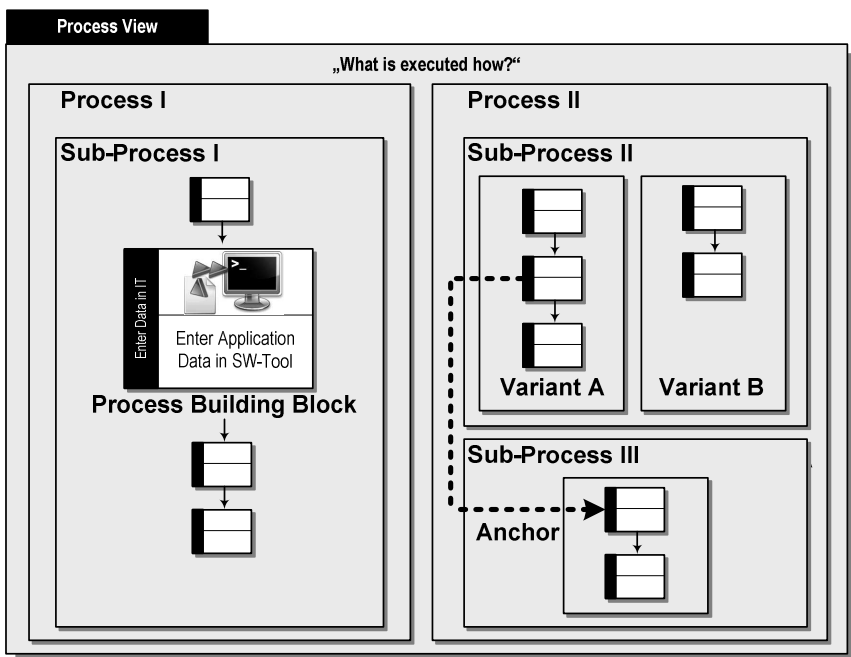

Fig. 2. Processes, Sub-Processes, Variants, and Anchors within the PICTURE-Method

Fig. 3. Example Process "Update Citizen Register" in PICTURE-Notation

deviations when different modellers are involved in a project. Additional information is collected in a structured way and by a standardized set of attributes per building block. Thus, the occurrences of specific combinations of PBBs with certain characteristics can be identified by a simple syntactic search. The analysis algorithm does not need to use natural language processing to capture the semantics of a PBBs, which avoids analysis problems like naming conflicts or structural conflicts [19].

Fig. 3 shows the process "Update Citizen Register" as an example of a PICTURE-model. The process is triggered when a citizen moves to a new address. By law a citizen is required to inform the government by handing in a change request. This fact is visualized by using the PBB "Incoming Document". Within the following four columns additional information are given regarding attributes, the organization responsible, the business object, and the resources used in order to process the building block. This information is relevant for an analysis of the process model. The next step within the process depicted by the next PBB is "Formal Assessment". In this PBB the completeness of the change request is verified. Afterwards the citizen register database is updated and the change request is archived for at least one year.

As the example shows, the focus of modelling with PICTURE lies on an easy capturing of the PA's process landscape. The models are annotated with facts that are relevant for ICT investments decisions. The use of PBBs and corresponding attributes prepares an automated analysis of the models. In the following the corresponding reporting framework is presented.

3   An Architecture to Evaluate ICT Investments

An ICT component such as a DMS, a WFMS, or an OA can have several optimization effects on the process landscape. The main quantifiable benefits are reductions of processing, transport and waiting times, elimination of errors, or a decreased material consumption. Due to legal regulations and the involvement of a large number of external agents reorganization in the public sector is highly constricted. It is difficult and time-consuming to provide a realistic forecast of these benefits. Therefore, it is helpful when the examination of the process landscape can be performed in a semi-automated form. Unlike traditional process modelling approaches the PICTURE-language allows for such a semi-automated analysis of the process landscape. The information that has been captured by the *modelling component* is saved in a *process model repository*. The corresponding architecture of the framework is described in Fig. 4. The PICTURE reporting framework is based on the following elements (c.f. Fig. 5):

Process building block pattern: Basis to analyze PICTURE-models in an automated form are the so called *process building block patterns (PBBPattern)*. A PBBPattern represents a specific weakness, inefficiency, or potential improvement in the process landscape. It consists of a sequence of PBBs with specific corresponding attribute values. A PBBPattern can contain required and/or unwanted PBBs as well as placeholders for arbitrary PBBs. A PBBPattern is used to search the process landscape for specific (sub-) processes that fit to its specification. The PBBPattern comprises all requirements a (sub-) process has to meet to be counted as a match. An example for a PBBPattern is the sequence of the PBBs "Enter Data into IT" and "Print Document". A PBBPattern is connected to a key figure. PBBPatterns together with its key figures are stored in the *PBBPattern / key figure repository*.

Key figure: A key figure is the basis to quantify the specific effect of an ICT component on a PBBPattern. It is applied to evaluate the occurrences of the PBBPattern in a quantitative form. The key figure is defined by a formula that is based on the attributes of the *Pattern elements* (e.g. "number of pages"), and (sub-) process attributes (e.g. "number of cases per year"). The data to calculate the key figure is derived from the attribute values of the (sub-) processes where the PBBPattern matches. An example for a key figure is the number of printed pages per year. It is calculated by a multiplication of the attribute "number of pages" in all the instances of the PBB "Print Document" with the corresponding (sub-) process attribute "number of cases per year". For this computation all (sub-) processes where the PBBPattern is found are considered. Consequently, a key figure refers to a *PBBPattern* and a *savings rate*.

Savings rate: The savings rate estimates the effects of the introduction of a specific ICT product. It is used to calculate a monetary savings potential of an ICT component based on a key figure. For instance it can be assumed that the introduction of a DMS saves 0.02 Euro per page printed in the organization. In the example of the key figure "printed pages per year" and with a savings rate of 0.02 Euro per page for a DMS an annual saving potential can be derived. Based on that data an investment decision for the DMS can be made. The savings rate is a project specific monetary value. A
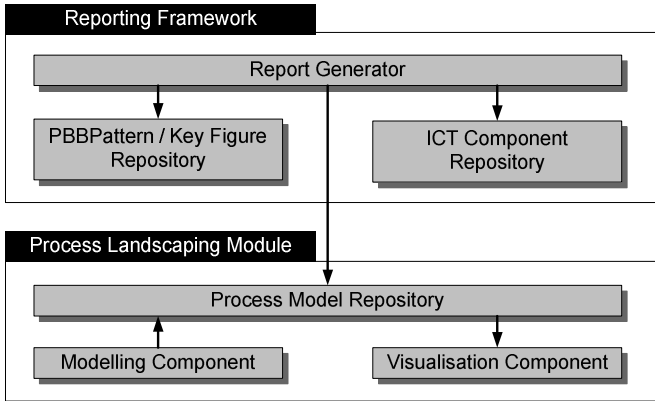
Fig. 4. Logical Architecture of the Reporting Framework and the Process Landscaping Module
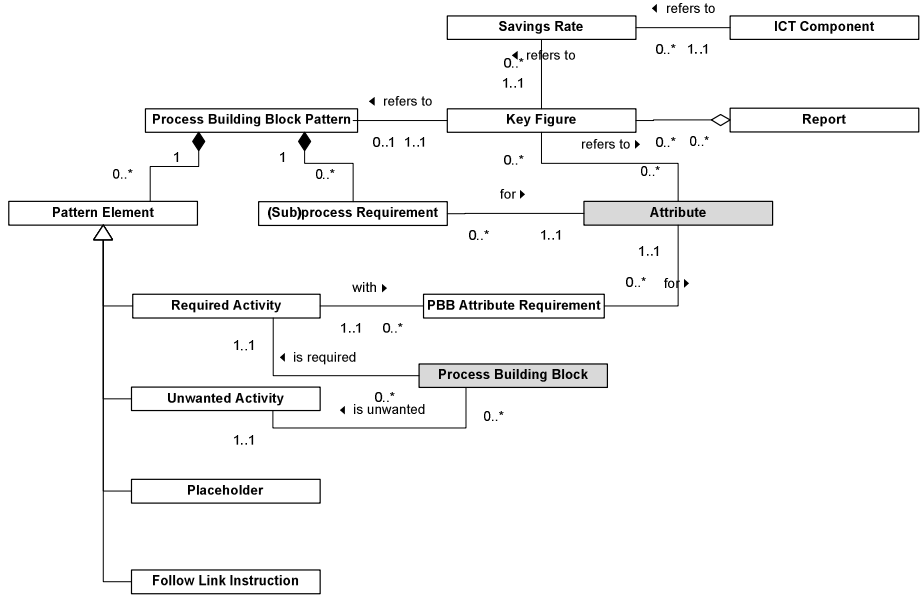
Fig. 5. Metamodel of the Pattern-based Analysis

possible source for savings rates is the cost accounting of the organization. The savings rates are stored in the *ICT component repository*.

Report: A report contains all relevant information for an ICT investment decision. It comprises a single or multiple key figures. For each key figure the corresponding savings potential is displayed and visualized in a chart. Reports can be designed for specific ICT components. For example there can be a report for the introduction of a DMS, with the number of "printed pages per year" and the corresponding savings

potential. The reports are created by the *report generator*. The report generator uses data from the *process model repository*, *the PPBPattern / key figure repository*, and the *ICT component repository*.

Pattern element: A pattern element represents a PBB which is required respectively unwanted in a (sub-) process with respect to a PBBPattern. A PBBPattern consists of a sequence of pattern elements. A PBBPattern matches a (sub)-process if all pattern elements have a corresponding (*required activity*) and have no (*unwanted activity*) counterpart in form of a PBB in the (sub-) process. A *placeholder* stands for a number of PBBs that are ignored in a (sub-) process. It defines the maximum number of PBBs until the next required activity has to be found in the (sub-) process when the PBBPattern matches. The f*ollow link instruction* requests the analysis algorithm to continue its search in the next connected sub-process. This allows for more intelligent patterns that span over the borders of a sub-process.

PBB attribute requirement and (sub-) process requirement: Beneath a sequence of pattern elements also specific attribute values are relevant in order to make a PBBPattern match. The *PBB attribute requirements* define for each *required activity* the value ranges for its attributes so that a PBBPattern applies. The *(sub-)process requirements* contain all attributes of a process or sub-process which are relevant for the pattern. Similar to the *PBB attribute requirements* a specific value or value range can be specified for the PBBPattern.

When the analysis algorithm is executed the *process repository* is scanned sub-process by sub-process and variant by variant for a specific PBBPattern. Whenever a match is found the corresponding key figures are derived based on its calculation formula. By using the savings rates the results are computed for each process and aggregated for every organizational level of the PA. An aggregation of the data at different stages allows for a drill-down and roll-up analysis. Hence, based on the key figures and the savings potential relevant processes for reorganization can be identified. By following the organization chart the user can identify processes with abnormal values.

PICTURE is able to forecast the potential benefits of an introduction of a single ICT or even a group of ICT components. Based on different scenarios potential savings can be forecasted. Due to an automated pattern-based analysis of the process models this process is less time-consuming than a manual analysis. To derive ICT-investment strategies from the analysis results the potential benefits (considered to be realistic) have to be compared with the introduction and maintenance costs of an ICT component. A forecast of these costs is usually much less time-consuming and more reliable than the forecast of the potential benefits.

4   Implementation and Use of the Reporting Framework

The reporting framework has been implemented as a module of the web-based PICTURE-tool. The module provides a construction kit for PPBPatterns, key figures, and reports. Similar to the process landscaping module it is designed to enable a simple and intuitive construction of these elements.

Fig. 6. Screenshot of the Construction of a PPBPattern

The PICTURE process landscaping module has previously been evaluated in two case studies [20, 21]. After that the reporting framework has practically been applied in a project in Altenberge, a small municipality in the Münsterland with about 10,000 inhabitants employing 40 officials in the core administration. In this case study 88 interviews with the officials were conducted. The project group was composed of a project manager, four sub-project managers and fourteen team members. Each interview was conducted by two team members together with one or two officials of the administration. In these sessions altogether 466 processes could be identified. Two-thirds of them were modelled as detailed PICTURE processes during the interviews using the process landscaping module. Based on the interviews an ICT reorganization potential analysis was performed. The following three steps have been performed to evaluate the investment in a DMS:

First, 30 DMS-related key figures and corresponding PBBPatterns were entered into the tool. They were configured with cost- and saving rates. Fig. 6 shows an example of a PBBPattern. It maps to incoming printed documents that are scanned within the next 15 PBBs and not forwarded before scanning. This example refers to the savings potential for a central DMS in a PA.

 Second, after the definition of the key figures and PBBPatterns the analysis algorithm was started for the project. The automated search for *PBBPatterns* such as the example in Fig. 6, the calculation of the *key figure* values, and the aggregation of these results took about half an hour.

Third, the evaluation results in form of reports were examined and manually interpreted. While exploring a holistic IT-Strategy for Altenberge, time consumption for creating, editing, and archiving documents could not justify an investment for the small administration Altenberge (c.f. Fig. 7). More promising as starting point for future investments was the time consumed for gathering all required information intra-organizationally, since this is performed mostly manually so far.

The processes, in which the about 300,000 pages are printed for internal use only, were also analyzed manually. For that purpose the tool provides a list of all relevant

Report Selection

DMS ▾ | Show

Key Figures of the Report

Figure	Freq.	Value	Costs	Max. saving rate	Potential savings
Processing time for viewing documents (min)	0	0	0€	8.00%	0€
Processing time for reediting documents (min)	55	9,335	9,335€	10.00%	934€
Processing time for first-editing created documents (min)	79	32,046	32,046€	5.00%	1,602€
Processing time for editing incoming documents (min)	0	0	0€	5.00%	0€
Processing time for internal electronic inquiries (min)	3	782	782€	5.00%	39€
Processing time for internal inquiries by phone (min)	1	32	32€	5.00%	2€
Processing time for internal inquiries in person (min)	2	118	118€	10.00%	12€
Retrieval of archived documents	0	0	0€	20.00%	0€
Processing time for archiving documents (min)	2	480	480€	10.00%	48€
Printed pages	326	393,441	19,672€	---------	---------
Printed pages for internal use	76	302,749	15,137€	50.00%	7,569€

Chart

Show quantitative view

Total savings potential: 10,206€

■ Processing time for reediting documents (min)
☐ Processing time for first-editing created documents (min)
☐ Processing time for internal electr. inquiries (min)
☐ Processing time for internal inquiries by phone (min)
☐ Processing time for internal inquiries personally (min)
☐ Processing time for archiving documents (min)
■ Printed pages for internal use

Only figures with values > 0 which have been selected during the report configuration are displayed.

To Report Configuration

Fig. 7. Screenshot of a DMS Report

processes ordered by the number of printed pages. It is possible in the tool to change the savings rates "on the fly" while interpreting the results. This allows for answering questions like "If the printing costs rise to the amount of x, will that justify the investment in a DMS?" With these mechanisms the break even for the ICT investment was calculated.

5 Conclusions and Further Research

In this paper we have employed the domain-specific modelling method PICTURE. PICTURE uses semantically predefined process building blocks for the process modelling. Based on that we have presented an architecture for an automated evaluation of ICT investments. The entire approach was implemented and evaluated in a case study in the small municipality Altenberge.

The example of Altenberge shows that not in every case ICT investments that were considered before are sufficient. In smaller organizations the costs for a software solution might exceed the expected benefits. The example also indicates that the aggregation of weaknesses in the process landscape can lead to the identification of additional reorganization potentials not expected beforehand and therefore provide more transparency for ICT investments.

The proposed methodology cannot only be used to calculate on ICT investments. Furthermore, it is possible to evaluate process reorganisation, efficient application of employees or later on efficient handling of citizen services as a whole.

The aggregation of the efforts needed in the project in Altenberge show – in addition to the efforts calculated in former projects [20] – that the enforcement of a process modelling and analysis project with the PICTURE method is much more efficient than comparable projects with generic modelling methods.

In our future work we aim to extend our set of weakness patterns for public administrations and will evaluate those in future projects. Additionally we will try to incorporate further aspects of process enhancements like process quality or customer satisfaction into our approach.

Acknowledgements

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Capability Maturity Framework for eGovernment: A Multi-dimensional Model and Assessing Tool*

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Abstract. This article describes an IT-based, eGov-centered and capability-driven model for assessing e-government capabilities and maturity of public agencies. It is the result of an initiative of the Chilean government to reinforce its e-government strategy. The proposed model, called eGov-MM (e-Government Maturity Model), has three dimensions (a cube) supporting business processes: information criteria, IT resources, and leverage domains. Changing the traditional and exclusive focus on IT, four Leverage Domains are defined: e-Strategy, IT Governance, Process Management, and People and Organization Capabilities. The Leverage Domains generate a hierarchical structure with a second level named Key Domain Areas. These areas should be measurable and controllable, so they are related to a third hierarchical level, called Critical Variables, allowing the model's elements to be assessed qualitatively and quantitatively. The capability and maturity of these variables associated with the intersection with the other two axes of the cube establish five levels of capability. The proposed model is strongly supported by the international experience and best practices for IT management and has already been field tested.

Keywords: e-government, capability, maturity model.

1 Introduction

The initial stages of e-government have usually been focused on the introduction of IT to improve the quality of data and to foster horizontal and vertical integration of back-office and front-office systems, generally following the 'stages of growth' model for e-government of Layne and Lee [1]. Through this approach, governments are seeking efficiency, effectiveness, and data quality improvement gains, all of them representing a complex pool of organizational and technological challenges [2]. This stage of e-government development characterizes most of the current strategies in the developing countries of Latin-America, and Chile is no exception.

However, we uphold, like other authors [3, 4] that a digital front end by itself is not a necessary and sufficient mechanism of change. In fact, a more reflective and critical use of IT is required, meaning that the organizational core processes and their supporting activities should also be considered when developing the digital front end. Thus, to foster an integrated approach of the problem's various edges, a multidimensional model would be a more useful approach.

A well known model also supporting this integrated view is Wimmer's holistic reference framework for e-government [5]. Wimmer's model supports integrated modeling of e-government initiatives, synchronization with technology development, and integration of several stakeholders' views in order to develop successful e-government initiatives. The Wimmer model is a good and useful basis for developing successful e-government applications. Although we share this holistic approach, our model is mainly focused on providing strategic reference for public organizations to establish e-government capability evolution roadmaps instead of being a framework for developing e-government projects.

This article presents a multidimensional capabilities maturity model, developed by the Chilean government with the support of the Universidad Técnica Federico Santa María (UTFSM), which addresses the above considerations by combining four domains of action of any large organization: organizational-wide strategic direction, IT governance, process management, and human resources. The rationale under the model design, the model structure, and a methodology for the capability and maturity determination are described in what follows.

As inputs for designing the proposed model, called eGov-MM (e-Government Maturity Model), the following sources of information have been considered:

- Best practices about e-government, identified through a national and international state-of-the-art survey [6].
- Models that provide the standard structure of a CMM (Capability Maturity Model).
- CMMs for e-government supporting the digital strategies of other governments worldwide.
- Other specific-purpose models which support the development of large organizations such as those based on IT Governance or Enterprise Architecture approaches.

The best practices included in the model's design are related to implementation, measurement and assessment of e-government strategies applied by the countries included in the state-of-the-art survey part of the current project. This survey's sample includes the United Kingdom [7, 8], the USA [9, 10, 11], Australia [12, 13, 14], Canada [15], Sweden [16], South Korea [17], and others.

The basic structure of the model was obtained through a comparative analysis of the two main international trends in maturity models applied to the software engineering area: CMMI [18] of the USA, and ISO/IEC 15504 [19] of Europe.

The specific content of our model arises from the above mentioned international best practices combined with relevant aspects of models specifically developed for e-government [12, 13, 14, 15, 16, 17], and from the authors' experience.

The approach of the main source for IT Governance was also analyzed: Control Objectives for IT, COBIT [20].

Section 2 presents the general structure of the model. Section 3 presents the details of its components: Leverage Domains and Key Domains Areas. In Section 4 the capability and maturity rationale of the model is described, including an example. We conclude the article in Section 5 by discussing the main advantages of the model and proposing the next steps for further evolution of the model.

2   e-Government Capability Maturity Model

The focus of the proposed model is driven by two concepts defined in the following paragraph: *e-government* and *IT Governance*.

Under the model rationale, e-government is the coupling of a government's need to improve quality and efficiency of government information and services delivered to citizens and business by public agencies, and the acknowledgment that ITs have a relevant role to reach such an objective. Therefore, e-government is based on the introduction of a new generation of transactional and distributed information systems whose main aim is the improvement of the core business and supporting processes.

This coupling between business needs and IT shifts the classical e-government challenge to a requirement for IT Governance, which is an area of activity where four factors are linked in a continuous improvement cycle: *IT* is supporting *business processes* which are executed by *people* that develop their *activities* in an organizational context.

It should be stated that the proposed model is intended to become a supporting tool for deploying nationwide e-government strategies, that is, it must be translated into an assessment tool which allows diagnosing the capability and maturity level of public agencies that are facing modernization challenges. It does not intend to be a process-based model, neither a tool to manage, monitor or control processes performance.

One dimension of the model is based on the definition of *Leverage Domains* and *Key Domain Areas* (KDAs). The leverage domains are a logical grouping of KDAs, which are the objects that really can be measured through what we call *Critical Variables*.

Additionally, the model includes a clear distinction between capability and maturity. In fact:

- *Capability level*: Is a property of each critical variable and KDA, the capability of the later determined by the capability of its constituent Critical Variables. The weighting of each constituent variable is a parameter which depends on the business domain in which the model is applied or the country's e-government reality.
- *Maturity level*: This is a property associated with the whole organization, each level corresponding to a set of KDAs in a given capability level. The organization's maturity level determines a roadmap for e-government development and for its service quality improvement strategy.

2.1   General Structure

The interaction of the three elements of the model is shown in Fig. 1. The business requirements over the information generated by the organization define *Information Criteria* that each KDA should satisfy by using *IT resources*. Each KDA (belonging to a given *Leverage Domain*) can be assessed by measuring the satisfaction of its objectives through its Critical Variables, which in turn determine the KDA's capability level.
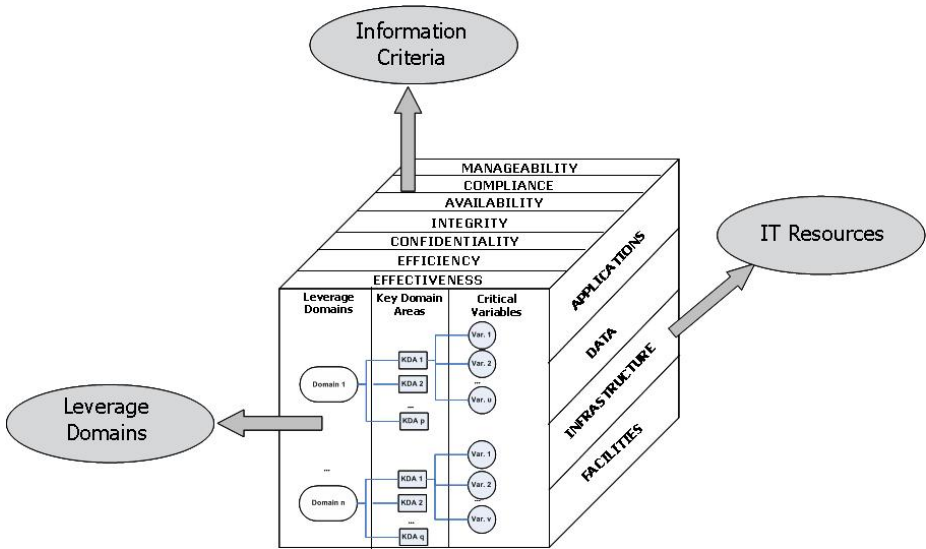
Fig. 1. Structure of the model showing the three dimensions of interrelated elements

2.2   Model Elements

The model elements are the Information Criteria, the IT Resources, and a hierarchy of Leverage Domains, KDAs and Critical Variables. The three dimensions of the proposed model plus the business requirements interact with each other, generating a dynamic cycle of continuous improvement as shown in Fig. 2.

The Information Criteria. To satisfy the business requirements, the information must satisfy certain criteria which constitute the business requirements for this information. These criteria for the information provided by a given KDA are:

- Effectiveness: the information must be relevant and pertinent as well as being delivered timely, correctly, and consistently.
- Efficiency: the information must be generated by the most productive and economical use of resources.
- Confidentiality: the information must be protected from unauthorized disclosure.
- Integrity: the information must be accurate and complete.

- Availability: the information must be available when required by the business process, and its associated resources and capabilities must be safeguarded.
- Compliance: the information must comply with those laws, regulations and contractual arrangements to which the business process is subjected, i.e., externally imposed business criteria as well as internal policies.
- Manageability: information must be easy to deal with and usable by management to operate the organization and exercise its fiduciary and governance responsibilities.
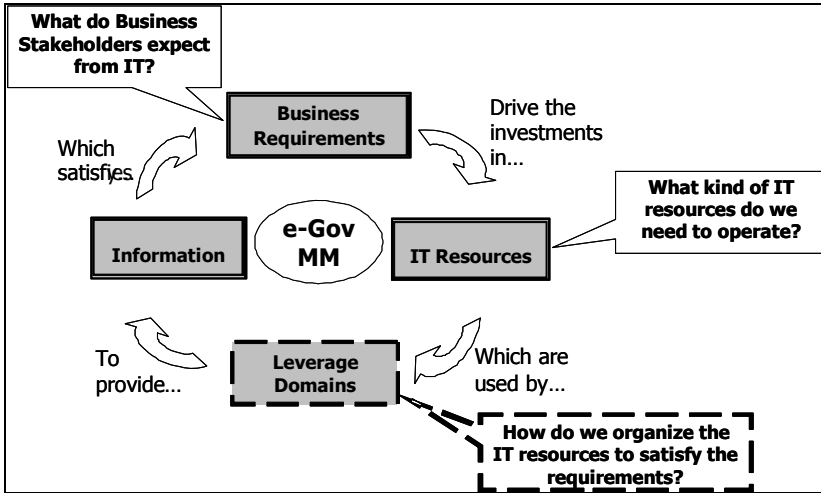
Fig. 2. Continuous improvement cycle provided by the eGov-MM

The IT Resources. The Leverage Domains require IT Resources to generate, store and deliver the information required to reach the business objectives. IT resources are:

- Applications: information systems and manual procedures used to process data and generate information.
- Data: on every format required by the business and processed by the information systems.
- Infrastructure: technology (e.g., hardware, operating systems, database management systems, networking, multimedia, etc.) that enables the processing of the applications.
- Facilities: the environment that houses and supports the IT infrastructure.

The Leverage Domains. They are the model's core elements, over which the different capability levels used to determine the current status of a given organization are established. Four Leverage Domains, 17 Key Domain Areas (KDA), and 54 Critical Variables have been defined. Fig. 3 shows the hierarchical structure of the four domains and their corresponding KDAs (the Critical Variables are not shown). Domains and KDAs are described in the next section.
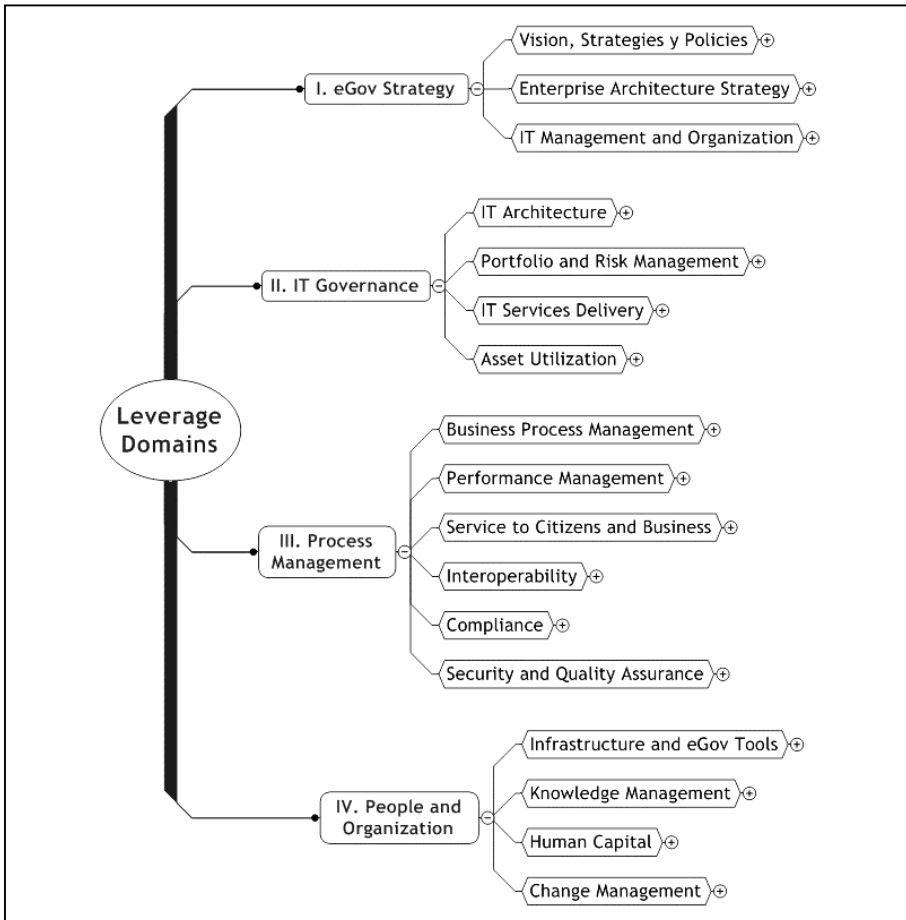
Fig. 3. Leverage domains and key domain areas

3   Leverage Domains and Key Domain Areas

3.1 e-Government Strategy

This domain represents the organization's capability to articulate a consistent e-government vision. In other words, the organization should have an IT strategy aligned with the business strategy, which should consider explicitly a direction in order to get involved in the electronic government. Its KDAs are:

(EGS-1) Vision, Strategies and Policies. It allows managing all IT resources according to the organization's vision, business strategy, and priorities. At the same time it allows alignment with national e-government policies.

Its objectives are measured or verified by: (1) Extent to which the stakeholders have collaborated to develop the organization's vision, strategy, and eGov and IT policies. (2) Degree of alignment between eGov vision and the business strategy. (3) Degree of alignment between eGov vision and the national eGov policies. (4) Degree of alignment of the IT, human capital, and economic resources strategies with the national eGov policies.

(EGS-2) Enterprise Architecture Strategy. It allows defining the strategy of Enterprise Architecture implementation, aligning it with national/industry reference models and considering a strategy of component reuse in order to build it.

Its objectives are measured or verified by (1) existence of an enterprise architecture; (2) existence of a consistent implementation strategy; (3) alignment with reference models; (4) level of reuse of service components; and (5) definition of a business architecture.

(EGS-3) IT Management and Organization. It allows defining the organizational structure to implement the IT strategy, to support new business opportunities, to follow industry technology trends, and to support the eGov and business visions.

Its objectives are measured or verified by (1) the existence of an instance to monitor the technology trends in order to plan and build an adequate IT strategy and enable the creation of new business opportunities; (2) the existence of a plan to create and support IT infrastructure to develop the eGov; (3) the existence of an organizational structure with clear positions and responsibilities; and (4) the existence of an IT process map including its interactions.

3.2 IT Governance

According to Weill and Ross [21] *"IT governance is the process by which firms align IT actions with their performance goal and assign accountability for those actions and their outcome."* It is therefore necessary to establish a framework which includes the definition of structure, processes, responsibilities, and goals in order to ensure that IT generates the desired outcomes and allows assessing how well the organization achieves its goals (i.e., ensure that IT investments facilitate a reasonable business return).

Having this definition in mind, the main aspects to be measured or verified to fulfill each KDA are defined. For this and the following Leverage Domains the KDA's objectives are not included simply due to space limitations.

(ITG-1) IT Architecture. (1) Development level of technical architectures that support eGov, including applications, technology, network, and security. (2) How well defined are service delivery methods and the required data entities.

(ITG-2) Portfolio and Risk Management. (1) How the organization manages new projects and programs. (2) The organization's skills and knowledge to manage project risks to make a smooth transition to eGov. (3) Existence of plans and actions to reduce or mitigate risks.

(ITG-3) IT Services Delivery. (1) Existence of standards which assure a homogenous quality in services and IT support either to the citizen or to internal

users. (2) Management and compliance with the accepted Service Level Agreements. (3) Existence of a formal procedure to manage changes to the infrastructure configuration supporting the critical processes of service delivery.

(ITG-4) Asset Utilization. (1) How the organization makes decisions to acquire new IT resources and their priorities. (2) The organization's practices to outsource or insource software development and hardware implantation. (3) Conformance level to the defined acquisition procedures. (4) Usage level of electronic procurement. (5) The level of effective and efficient use of IT assets.

3.3   Process Management

This domain represents the organization's capability to articulate a process-based structure with well documented, standardized, and regulation-compliant processes. A process-based organization should allow an online service delivery to citizens with guaranteed quality and facilitate a continuous improvement process.

(PRM-1) Business Process Management. (1) Existence of a mechanism to transform the service delivery process into an eGov business model characterized by a continuous improvement cycle.

(PRM-2) Performance Management. (1) Existence of a mechanism to measure, assess, and learn from the feedback provided by customers about service effectiveness. (2) Existence of a set of balanced goals and measurements in order to control the cost and benefits of the eGov initiatives.

(PRM-3) Service to Citizens and Business. (1) Documentation and modeling of business processes supporting delivery of the service to citizens and enterprises. (2) Deployment of a quality measurement system of the services delivered to citizen and enterprises. (3) Availability of high-usability electronic channels and support resources backing the spreading of services between citizen and enterprises.

(PRM-4) Interoperability. (1) Integration level of business strategy and inter-agency processes achieved with other agencies. (2) Development level of semantic interoperability enabling systems to combine external information in order to process it in a meaningful manner. (3) Existence of technical interoperability that includes key aspects such as open interfaces, interconnection services, data integration and middleware, data presentation and exchange, accessibility, and security services.

(PRM-5) Compliance. (1) Compliance level with internal and external norms, policies, and procedures related to eGov. (2) Existence, if required, of enough resources to facilitate compliance with internal and external regulations. (3) Existence of appropriate incentives to promote compliance with internal and external norms.

(PRM-6) Security and Quality Assurance. (1) Existence of a formal quality assurance system based on recognized standards aligned with the business objectives and promoting a continuous improvement service. (2) Existence of a formal information security management system based on recognized standards. (3) Implementation level of a structured program to measure the quality of service and supporting tools.

3.4   People and Organization Capabilities

This domain determines the level of organizational and people competences required for an effective and efficient eGov implementation.

(POC-1) Infrastructure and eGov Tools. (1) Availability of fundamental eGov tools and technologies (like workflows, electronic documents, electronic signature, intranet, etc.) supporting the organization in the design, implantation, and operation of eGov directives. (2) Existence and usage level of value-added tools like Business Intelligence, ERP, SCM, and others. (3) Existence and usage of relevant hardware infrastructure for online services like datacenters, networks, servers, etc.

(POC-2) Knowledge Management. (1) Existence of procedures to access, store, share, use, and update the knowledge related to IT and eGov. (2) Existence of adequate IT infrastructure to manage knowledge.

(POC-3) Human Capital. (1) Existence of mechanisms to ensure the availability of people competences required to support the eGov initiatives. (2) Consistency between the previously defined competences and the selection and hiring process of IT people required in the organization. (3) Existence and suitability of a scheduled program and procedures to train and educate IT and non-IT people in the organization to assure a professional development.

(POC-4) Change Management. (1) How the organization is arranged to manage the change and its cultural impact. (2) Plans to reduce the natural opposition to change and facilitate the use and incorporation of new technologies and systems.

4   Staged Capability and Maturity Model

4.1   Capability and Maturity Determination

The model considers a five-level staged development of the KDAs capability. Each KDA includes variables which have capability levels of their own; a weighted average of the resulting variables' capability levels determines the KDA's capability level. To determine the variables' capability levels, a set of common patterns was defined: in level 1 the capability does not exist, although the organization may have recognized its importance; in level 2 the capability exists but it is neither structured nor formalized; in level 3 the capability exists and is well documented and structured; in level 4 the capability is structured, and metrics and automatic tools have been defined and standardized in order to improve its effectiveness and efficiency; and finally, level 5 implies all the above plus the use of best practices and international standards in the achievement of the capability.

To measure the capacity level of each variable a web-based assessment tool was built which has a set of questions for each variable at each level. The questions are directly related to the roadmap that allows the variable's capacity evolution.

The organizational maturity level corresponds to a combination of KDAs which are in a given capability level. Following a structure similar to that of CMMI, for each

of the five maturity levels a KDA combination has been defined. For example, maturity level 2 includes only 8 of the 17 KDAs, all of them at capability level 2. Maturity level 3 includes 14 of the 17 KDAs, with 9 at capability level 3 and 5 at capacity level 2.

4.2 Using the KDA Capability Levels

This subsection presents an example of how the KDA's capability levels are defined. The selected KDA is *Vision, Strategies, and Policies* from the *e-Government Strategy* leverage domain. Three capability levels are described.

Vision, Strategies and Policies. This KDA must satisfy the business objective of managing and conducting all IT resources according to the business strategy and its priorities. Its relevant Information Criteria are Effectiveness and Availability, and the main IT resources required are Applications and Data.

Its level of capability is determined by the following variables: (1) Strategy alignment with the national eGov directions. (2) CEO and upper management commitment with the implementation of eGov initiatives. (3) Periodic communication to all involved people within the organization. (4) Resource assignment commitment with the implementation of the organizational eGov strategy.

The capability levels are defined below. Within each level four assertions are presented, one for each variable related to the KDA.

- *Level 1 "Initial"*: (1) There is evidence that the enterprise has recognized that the strategy alignment is important and needs to be addressed; however, there are no actions nor approaches that tend to be applied. (2) There is no awareness and need for the top manager to get involved early with the eGov initiatives. (3) There are no formal actions to communicate the eGov initiatives to the people in the organization. (4) There is no evidence of resources specifically allocated for the eGov implementation.

- *Level 3 "Defined"*: (1) The eGov Vision is well defined and it is integrated to the business strategy. There is a policy about IT and eGov strategy planning and it is well documented. (2) Top manager and directors are committed to and get involved early in the eGov initiatives. (3) The eGov vision, policies and strategy have been communicated to and are well understood by all personnel in the organization. (4) Enough monetary resources to support eGov initiatives have been assigned. Their allocation is included in the organization's annual budget.

- *Level 5 "Optimized and Integrated"*: (1) The vision is periodically reviewed according to stakeholders' needs and new technologies. The strategy and policies are periodically updated according to feedback from clients, suppliers, and government policies. The strategy planning process is continuously compared with the industry standards. (2) Manager and directors have an explicit role assigned in the IT strategy planning process. (3) Personnel, clients, and partners are considered when the eGov vision is developed. (4) Resources assigned to the eGov initiatives are periodically adjusted according to a cost/benefit analysis and to client satisfaction.

5 Conclusions and Future Work

Based on the international experience on maturity models and e-government specific models intended to measure the capability of public agencies in developed countries, a model was built and tuned to the characteristics of the public sector of an emerging country. However, two features of the model allow it to be easily adapted to other realities: first, the weighted relationship between critical variables and key domain areas; and second the CMMI-compatible structure to calculate organization maturity.

During the model's development phase, internationally accepted best practices for IT Governance, like COBIT, were analyzed. Thus, two of the three eGov-MM dimensions are already internationally agreed on, namely information criteria and IT resources.

The third dimension (i.e., the Leverage Domains) intercepts with the others according to their relevance to a given Key Domain Area. thus facilitating a better adjustment of the model to the diversity of public agencies' realities. This dimension is also strongly based on internationally accepted practices.

The hierarchy of Leverage Domains, its KDAs, and Critical Variables determine the organization's maturity, and they are involved in a dynamic cycle with business requirements as the main triggering input. This virtuous cycle allows a continuous improvement of service delivery by public agencies, making it easier for them to transit towards higher maturity levels through planned roadmaps.

Given the model's attributes, capturing the field experience obtained through its application in the public sector in Chile, it has allowed its optimization. It had a first adjustment cycle, mostly derived from the results of a pilot test held in April 2008 with the participation of eight public agencies. Massive testing is under way, starting in June 2008, including thirty public agencies. This massive testing is supported by a web-based assessment tool, call center support and a strong preassessment training and awareness program.

The model's structure may be seen as rather complex, making its full application difficult. However, a flexible web-based tool developed to support the assessment counteracts this potential disadvantage. It also goes together with the definition of specific profiles that should provide information for KDA subsets, reducing the information collection workload and ensuring the quality of the collected data.

We expect that this model will become a useful tool to assess public agencies in the Chilean government and to support e-government strategic programs in other countries. It is also expected to become a tool for supporting the IT investment strategies, e-government roadmaps, and interoperability strategies of the public sector.

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eGovernment Front-End Services: Administrative and Citizen Cost-Benefits

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Abstract. This paper proposes a cost-benefit model for evaluating front-end e-government services. The citizens' gains are estimated by calculating the citizens' time savings multiplied with their salary earned. The administrative costs and benefits are measured by time savings and the corresponding savings in terms of staff salaries. By illustrating the model through four scenarios for changes in frequency and time savings for case handling and general inquiries in a public state agency, this paper contributes to the field of development of e-government assessment methodologies.

Keywords: E-government, front-end services, impact assessment, evaluation method.

1 Introduction

Using a case of proposed implementation of digital front-end services in a public agency, this paper contributes to the refinement of cost-benefit analysis of e-government applications. The paper focuses on the front-end service addressing the administrative cost and benefits and on how to measure and balance these against the citizens' costs and benefits of front-end services such as e-health applications, social security, reporting taxes, searching and borrowing books electronically through public sector run libraries.

In the framework proposed in this paper, we use time savings as a key variable in estimating the costs and benefits of front-end services. Arguing that the time citizens are online using public services could alternatively have generated an increase in their income, there is an increase in value of front-end public services for the citizens if there occurs time savings using e-enabled front services. We measure the administrative cost-benefits using salary/ income to transform the time savings into monetary terms.

The proposed framework is developed as part of the work on the Public Sector Process Rebuilding (PPR) approach [1], [2], [3]. The key argument in PPR is that e-government needs to demonstrate its value not for public administration exclusively. Rather, e-government application needs to take its departure in demonstrating benefits for the citizens.

2 Framework for Assessment of Front-End Services

Our framework does not have any normative assumptions that implementing front-end services leads to time savings. Instead, our point of departure for the proposed framework is that front-end services *might* lead to substantial time savings for the citizens and the administration, but *can* also lead to more time consumption for both parties. The curves in Figure 1 capture the notion that implementation of front-end services might lead to a differentiated set of savings rather than uni-directional savings. In one scenario, the front-end service might benefit public administration and the citizens by substantial time savings (scenario A), in other scenarios the citizens' time savings might be larger than the gains of the public administration (scenario B) or the public administration might harvest internal administration gains while citizens experience that they have to use more time for using the digital front-end services (scenario C). Finally, front-end services can lead to more time-consuming services and more administrative burdens (scenario D).

The administrative costs and benefits are measured by time savings and the corresponding salary savings, whereas the citizens' cost savings are estimated by calculating the user's time spent on using the front-end service relative to his annual income.

The administrative costs and benefits are measured by the costs and benefits related to the specific case handling (processing and archiving, finding/ revisiting cases, internal evaluation of cases, meetings, and the external expert evaluations of cases) and inquiries. Our framework is focused on addressing the changes in
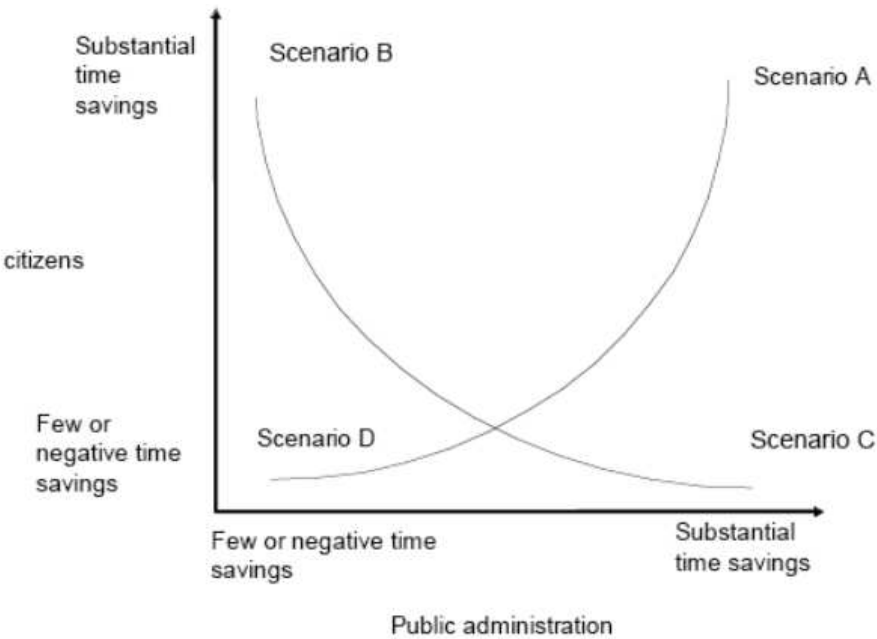
Fig. 1. Time savings for citizens and public administration

personnel costs since these constitute the lion's share of total budget in state agencies dealing with case handling. Inquiries are divided into three groups: inquiries regarding the specific case handling, inquiries being of more general nature, and inquiries from other agencies/ department. Finally, we have a residual category of "others" to capture the costs (and benefits) not being categorized in one of the two other main groups (case handling and inquiries).

In providing the baseline data needed for the calculation of the outcome of the scenarios, the staff costs need to be distributed into time spent and costs of case handling, inquiries, and other costs. The net benefits Y for the administration are expressed in the formula below, where X equals the salary, Z hours of work, T being the time spent on the task, and F the frequency of the task:

$$Y_{administration} = (X_{administration}/Z_{administration}) * (T_{physical\ operations} * F_{physical\ operations} - T_{digital\ operations} * F_{digital\ operations}) \tag{1}$$

From the citizens' point of view, the value of interaction is estimated by calculating the time spent accessing the web service in relation with their annual income. Accordingly, if a person earns X Euro for Z hours of work, we will argue that if that person spends 1 hour online completing a form and receives a response back within the same hour – whereas previously the person would have spent 2 hours offline completing the same operation – the overall benefit gained by the person would be of X(1) Euro. Benefits such as quicker refunds and payments and citizens' costs associated with learning how to use the new application can be added as additional variables. The net benefits Y for the citizens are expressed in the formula below:

$$Y_{citizens} = (X_{citizens}/Z_{citizens}) * (T_{physical\ operations} * F_{physical\ operations} - T_{digital\ operations} * F_{digital\ operations}) \tag{2}$$

The net benefits of the front-end service is calculated by subtracting the benefits for the administration and citizens from the initial expenditures for the development and training and the costs of back office integration (I):

$$Y_{total} = \sum Y_{administration} + \sum Y_{citizens} - I_{development\ \&\ training} - I_{back\ office\ integration} \tag{3}$$

The proposed framework does not incorporate risk (political risk, organizational risk, user risk, technological risk, vendor risk, or execution risk) or pre-implementation costs such internal investments for infrastructure and work-process redesign. Also, there might be a time lag in the savings requiring the public administration to demonstrate savings up front, whereas the time savings for the citizens might be on longer term. In this paper we have not included calculation of net-present value (NPV), depreciation, annual discount rate, etc. Such calculation can be clearly be added in further implementation of the framework. Inspiration for how to perform calculation of risk of e-government investments can be found in [4], whereas detailed guidance on cost-benefit analysis can be found in [5].

3   Case Description and Baseline Data

The framework is explored with baseline and scenario data from a conjectural state agency. The state agency is primarily occupied with case handling and employs 100

full-time staff, equivalent to 166,000 hours of work costing 46.4 million Euro. A workflow analysis and mapping of the activities has identified that approximately 50% of the work hours can be linked to case handling (85,207 hours) and 4% answering inquiries from either citizens or other staff (7,169 hours). The remaining 46% are spent on what can be considered support functions and overhead.

Annually, there are 8,000 completed cases, involving processing and archiving (10,000 hours), finding and revisiting the cases (15,000 hours), evaluation and internal meetings for discussion and internal quality assurance of the case handling (35,000 hours), and the use of external expert evaluation of the cases. The external evaluation is a very costly budget item exceeding the internal costs of processing and the internal evaluation. Each year, external experts are paid for more than 21,000 hours of assistance in evaluations.

The agency receives 17,300 inquiries from citizens about their cases (on average 15 minutes are spent on answering directly inquires to cases) and 7,000 inquires from citizens (telephone, letter, fax, and e-mail), which are not directly related to cases. In addition, there are 2,000 annual inquiries from other agencies and departments (on average, each 20 minutes are spent directly on the cases, and 30 minutes on various follow up activities). The 2,000 inquiries come from 45 different locations/ people.

4   Implementing Front-End Services

The case conveyed in the subsequent sections illustrates the dilemmas and challenges in evaluation of IT in a government agency that wants to introduce front-end services through the Internet. The objective of a government agency considering deploying the front-end application is to reduce the operating costs of the service provision. Due to a pan-governmental IT uptake initiative, all employees in the agency have been equipped with ADSL connection and computer in their homes and PDA (iPaq) enabling them to access cases also when out of office or not at home. The employees communicate with their colleagues within the department and revisit continuously their case handling practices. This is done informally at weekly meetings (every Thursday morning). This amounts to about 5,000 hours annually. Also, there are a number of planning meetings which amounts to 35,000 work hours. There are 15 external evaluators on a permanent contract with the agency. In addition, external experts are contracted on an ad hoc basis to evaluate and provide input to the validation of the decisions. In the communication with the expert, e-mail is the preferred media. A consulting company estimated that in the communication between the administration and the external experts, according to the hours claimed by the expert for their work, a total of 21,207 hours are paid on an annual basis to the experts.

The case workers and citizens use up to 15 different documents during the case handling process. After the digitalization, they have managed to reduce this to 12 different documents. The initial investment (development and implementation) including training is estimated to be 214,286 Euro and adjustment of existing applications will cost another 571,429 Euro. The annual replacement costs (buying new modules, licenses etc.) of the application is estimated to be 107,142 Euro.

4.1   Outlining the Scenarios for the Front-End Services

The four scenarios explored in this section are variations with respect to the frequency citizens will use the proposed services and to how cost-effective the public administration is at completing cases and inquiries. For reasons of simplicity we have calculated only four scenarios and placed the calculations in Appendix A and B at the end of the paper.

In all scenarios A, B, and D, the administrative marginal case handling costs are reduced, whereas in scenario D the agency is being tested to the limit not only by a substantial higher traffic through the front-end service. Also, back office procedures are not adequate to meet the demand and lead to longer turn-around circles, hence increasing the marginal costs and the total costs. In scenario C and D the gains that the citizens experience are less than the costs with respect to the time savings. The increased demand from citizens in form of increases in general inquiries does not lead to extra costs in these scenarios for the administration and therefore does not lead to any attention. The scenarios are detailed below.

Table 1. Scenarios for front-end services: Change in case handling and inquiries

Sc	Public administration	Citizens
A	Productivity increase in*) - Processing and archiving cases - Finding & revisiting cases - Meetings - External evaluations - Answering case inquiries from citizens - Answering general inquiries from citizens - Answering inquiries from agencies/ departments Frequency changes: - Inquiries from citizens (increase) - General inquiries (increase) - Inquiries from other agencies/ departments (decrease)	Time savings in*) - Case preparation - Localizing forms and information - Understanding the requirements - Preparation, transportations, and meetings with staff - Communication with the administration regarding specific case inquiries - Communication with the administration regarding general inquiries Frequency increases in: - General inquiries Frequency decrease in: - Case inquiries from citizens
B	Productivity increase in*) - Processing and archiving cases - Answering case inquiries from citizens - Answering case inquiries from citizens (substantial reduction) - Answering inquiries from agencies/ departments (subs. reduction) Decrease in productivity in* - Finding & revisiting cases - Internal evaluation of cases - Meetings per case - External evaluations Frequency increases in: - Inquiries from citizens	Time savings in*) - Case preparation - Localizing forms and information - Understanding the requirements - Preparation, transportations, and meetings with staff - Communication with the administration regarding specific case inquiries - Communication with the administration regarding general enquiries Frequency increases in: - General inquiries (substantial increase) - Case inquiries (substantial increase)

Table 1. (*continued*)

S c	Public administration	Citizens
	- General inquiries (escalating) - Inquiries from other agencies/ departments	
C	Productivity increase in*) - Processing and archiving cases finding & revisiting cases - Meetings per case - External evaluations - Answering case inquiries from citizens - Answering general inquiries from citizens - Answering inquiries from agencies/ departments Frequency increases in: - Inquiries from citizens - General inquiries Frequency decrease in: - Inquiries from other agencies / departments	Increases in time used on *) - Localizing forms and information - Understanding the requirements - Preparation, transportations, and meetings with staff - Communication with the administration regarding specific case inquiries (per case) - Communication with the administration regarding general enquiries Frequency increases in: - General inquiries (substantial increase) Frequency decrease in: - Case inquiries (substantial increase)
D	Productivity increase in*) - Processing and archiving cases - Answering case inquiries from citizens - Answering general inquiries from citizens (substantial reductions) - Answering inquiries from agencies/ departments (subs. reductions) Decrease in productivity in*) - Finding & revisiting cases - Internal evaluation of cases - Meetings per case - External evaluations Frequency increases in: - General inquiries from citizens - Inquiries from citizens - Inquiries from other agencies / departments	Increased time used on* - Localizing forms and information (substantial increase) - Understanding the requirements (substantial increase) - Preparation, transportations, and meetings with staff (substantial) - Communication with the administration regarding specific case inquiries - Communication with the administration regarding general enquiries Frequency increases in: - Frequency of general inquiries (substantial increase) - Frequency of case inquiries (substantial increase)

In scenario A, we expect that the increased level of information and self-service through the Internet will result in less staff-time used on processing the cases. In scenario B, the front-end service leads not to less but manifold *more inquiries* from citizens and other agencies/ departments. In scenarios C and D, the citizens provide more general inquiries but experience an increase in the time they use to find the right forms, understanding the requirements and that the communication with the administration regarding the cases takes more time. The inquiries from other departments decrease in scenario C and increases in scenario D. In case D there is a

Table 2. Summary of administrative and citizen benefits (Euro)

Variable		Scenario A	Scenario B	Scenario C	Scenario D
(1) Administrative savings	$Y_{administration} = (X_{administration}/Z_{administration}) * (T_{physical\ operations} * F_{physical\ operations} - T_{digital\ operations} * F_{digital\ operations})$	11,811,875	-13,533,706	11,811,875	-13,533,706
(2) Citizens' savings	$Y_{citizens} = (X_{citizens}/Z_{citizens}) * (T_{physical\ operations} * F_{physical\ operations} - T_{digital\ operations} * F_{digital\ operations})$	1,301,473	1,244,037	-614,529	-1,765,505
(3) Net benefit	$Y_{total} = \sum Y_{administration} + \sum Y_{citizens} - I_{development\ \&\ training} - I_{back\ office\ integration}$	12,325,633	-13,077,384	10,409,631	-16,086,926

substantial increase in the time citizens spend for completing the cases. In the administration, the results are opposite: the burden of completing and entering the information into the digital format are outsourced to the citizens and the staff experience substantial productivity increases with regards to the processing and archiving the cases and in answering general questions. The administrations' ability to find the cases and meetings regarding the cases has led to more time consumption, hence increased the costs.

4.2   Transferring Time Savings to Monetary Values

The value of interaction from the customer point of view is more challenging. In our framework we estimate the value by calculating the time spent accessing the web-service in relation to their annual income. In the proposed scenarios, the average citizen using the front-end service earns 24,270 Euro for 1,660 hours of work. If that person spends one hour completing a complaint form and previously had to spend two hours for the same operation off-line, the net benefit for the citizen is estimated to be 14.6 Euro.

In the four scenarios we have assumed that the number of cases are constant but have varied the time spent on the citizens' case preparation, localizing the forms and finding the right information, understanding the requirements, and preparing documents to be used in phone, online and physical meetings. The online case handling lead in scenario A and B to time savings for the citizen, but in scenario C and D the case handling process becomes more time consuming because of the mails sent back and forth and the constant need for making inquiries on the status of the case progress. Also, citizens make more general inquires in scenario B and D and experience in scenario D that governments are less effective in providing precise

information. Citizens spend more time verifying the often ambiguous answers received by e-mail and end up having to call the administration to ensure that the interpretation of the e-mail is correct. Also, various e-mail addresses that citizens write to are in scenario C and D not being answered promptly and seldom being categorized by the administration so the next person the citizen speak with can find the information.

In result, each time the citizen make an inquiry, (s)he needs to send a series of mails to describe the case progress. The citizen becomes in the scenario C and D the record keeper. Adding the citizens' time savings to the calculations of the administrative time saving, scenario A will have a net impact of about 12 million Euro, whereas scenario B will net -13 million Euro. The initial investment of 787,715 Euro to development and implementation (214,286 Euro) and adjustment of other, back-office applications (571,429 Euro) is in scenario A and C beneficial if factoring in the citizens benefits. Thus scenarios A and C are the only scenarios in which the increased administrative expenditures are more than compensated by cost reductions.

4.3 Discussion of Findings and the Proposed Framework

Distinguishing between public administration and citizens as proposed in the framework is to some extent artificial. There are several examples where citizens are direct and active parts of producing the public service, which makes a distinction between administration and citizens problematic. We argue, however, that the explicit focus on the two stakeholders can stimulate the debate and the implementation of front-end services: why are governments implementing the front-end service and for whom?

Two of the scenarios gave net benefits if focusing on administrative benefits only, whereas two others gave net gains of incorporating the citizens' gains in the cost-benefit analysis. Thus, the scenarios illustrate the e-service paradox and the challenges government faces with regards to provision of e-services and the financing of the services. The proposed front-end e-service is to be financed by savings on personnel costs and thereby put strong demands on the payback calculation.

By addressing more qualitative issues, the digitalization of the front-end services leads to more frequent and instant interaction between the individual case worker and citizens. Yet, scenario B led to increases in intra-governmental meetings and rapid increases in inquiries and information retrieval from other agencies and departments. Our model did not account for the potential indirect impact of this increased digital interaction in other agencies and departments.

Even in the scenarios where the processing time for the case handling is reduced, the employees and the citizens might experience less service provision, since the user interface on the website does not allow open-ended comments or document attachments. Furthermore, the overall stress level for the employees might be increased due to the higher frequency of specific and general inquiries and the subsequent expectations of quick answers to them. These concerns are, however, not specific for the case explored, but a generic challenge when using cost-benefit analysis and a reason why others explore more rich methodologies such as balanced scorecard techniques [6].

Table 3. Time savings for the public administration

Activities		Baseline data	Scenario A	Scenario B	Scenario C	Scenario D
Case-handling	Processing and archiving	8,000* 1.25 hour= 10,000 hours	8,000* 0.625 hour= 5,000 hours	8,000* 0.625 hour= 5,000 hours	8,000* 0.625 hour= 5,000 hours	8,000* 0.625 hour= 5,000 hours
	Finding/ revisit cases	8,000* 1.875 hour= 15,000 hours	8,000* 0.5 hour= 4,000 hours	8,000* 2.625 hour= 21,000 hours	8,000* 0.5 hour= 4,000 hours	8,000* 2.625 hour= 21,000 hours
	Internal evaluation of cases	8,000* 0.625 hour= 5,000 hours	8,000* 0.625 hour= 5,000 hours	8,000* 2.875 hour= 23,000 hours	8,000* 0.625 hour= 5,000 hours	8,000* 2.875 hour= 23,000 hours
	Meetings	8,000* 4.375 hour= 35,000 hours	8,000* 3.125 hour= 25,000 hours	8,000* 4.625 hour= 37,000 hours	8,000* 3.125 hour= 25,000 hours	8,000* 4.625 hour= 37,000 hours
	External evaluations of cases	8,000* 2.651 hour= 21,207 hours	8,000* 1.25 hour= 10,000 hours	8,000* 5.625 hour= 45,000 hours	8,000* 1.25 hour= 10,000 hours	8,000* 5.625 hour= 45,000 hours
<1)	Total	86,207 hours	49,000 hours	131,000 hours	49,000 hours	131,000 hours
Inquiries	Case handling	15 min x 17,300 inquiries = 4,325 hours	5 min x 10,000 inquiries = 833 hours	5 min x 50,000 inquiries = 4,167 hours	5 min x 10,000 inquiries = 833 hours	5 min x 50,000 inquiries = 4,167 hours
	General inquires	10 min x 7,000 inquiries = 1,167 hours	3 min x 17,000 inquiries= 850 hours	1 min x 87,000 inquiries = 1,450 hours	3 min x 17,000 inquiries = 850 hours	1 min x 87,000 inquiries = 1,450 hours
	Other agencies/ departments	50 min x 2,000 inquiries = 1,667 hours	15 min x 1,700 inquiries = 425 hours	10 min x 31,000 inquiries = 5,167 hours	15 min x 1,700 inquiries = 425 hours	10 min x 31,000 inquiries = 5,167 hours
(2)	Total	7,159 hours	2,108 hours	10,784 hours	2,108 hours	10,784 hours
(3) Other	(constant)	72,634 hours	72,634 hours	72,634 hours	72,634 hours	72,634 hours
Total	(1)+(2)+(3)	166,000	123,742	214,418	123,742	214,418

Table 3. (*continued*)

Activities	Baseline data	Scenario A	Scenario B	Scenario C	Scenario D
Reduction		42,258 hours	-48,418 hours	42,258 hours	-48,418 hours

Table 4. Time savings for citizens

Activities		Baseline data	Scenario A	Scenario B	Scenario C	Scenario D
Case-handling	Case preparation	8,000 cases * 16 hours = 128,000 hours	8,000 cases * 10 hours = 80,000 hours	8,000 cases * 10 hours = 80,000 hours	8,000 cases * 16 hours = 128,000 hours	8,000 cases * 16 hours = 128,000 hours
	Localizing forms and information	8,000 cases * 1 hour =8,000 hours	8,000 cases * 0.3 hour = 2,667 hours	8,000 cases * 0.3 hour = 2,667 hours	8,000 cases * 2 hours =16,000 hours	8,000 cases * 4 hours =32,000 hours
	Understanding requirements	8,000 cases * 2 hours = 16,000 hours	8,000 cases * 1 hours = 8,000 hours	8,000 cases * 1 hours = 8,000 hours	8,000 cases * 4 hours = 32,000 hours	8,000 cases * 6 hours = 32,000 hours
	Preparing, transportation, and meetings with staff	8,000 cases * 6 hours =48,000 hours	8,000 cases * 3 hours= 24,000 hours	8,000 cases * 3 hours= 24,000 hours	8,000 cases * 8 hours= 64,000 hours	8,000 cases * 12 hours= 96,000 hours
(1)	Total	200,000 hours	114,667 hours	114,667 hours	240,000 hours	288,000 hours
Inquiries	Case inquiries	15 min x 17,300 inquiries= 4,325 hours	5 min x 10,000 inquiries= 833 hours	5 min x 50,000 inquiries= 4,167 hours	20 min x 10,000 inquiries= 3,333 hours	20min x 50,000 inquiries= 16,667 hours
	General inquires	10 min x 7,000 inquiries= 1,167 hours	3 min x 17,000 inquiries= 850 hours	1 min x 87,000 inquiries= 1,450 hours	15 min x 17,000 inquiries= 4,250 hours	15 min x 87,000 inquiries= 21,750 hours
(2)	Total	5,492 hours	1,683 hours	5,617 hours	7,583 hours	38,417 hours
Total	(1)+(2)	205,492 hours	116,350 hours	120,284 hours	247,583 hours	326,417 hours
Time savings			89,142 hours	85,208 hours	-42,091 hours	-120,925 hours

5 Conclusions

In this paper we have presented a cost-benefit model and applied this model to the evaluation of front-end services. Quantifying the impacts of front-end services from the perspective of government and the citizens has given insight into benefits of IT-systems. Although the number of variables incorporated in the model are very limited, we propose that the formal evaluation can complement the informal and daily evaluation of IT systems, and in situations where the decision to acquire the IT application has not yet been taken.

Another important limitation is to carefully consider the independent and dependent variables for the cost-benefit study. Where most would agree that there is a short-term, dynamic and interactive relationship between the governmental unit, the citizens, and the front-end service, the proposed framework has a unidirectional view and could be supplemented by incorporating feedback mechanisms and governance-oriented variables. While the model at this stage does not include such variables, we encourage other researchers to add and extend the model using, for example, a refinement of the measurement technique, and possibly using a triangulation of methods, such as cost-benefit analysis and structured case approach [7] and process evaluation [8].

Finally, the proposed framework takes its point of departure from the assumption that the most important variables with regards to front-end service can be quantified and reliable data can be collected. As pointed out by [9], such assumptions are ideal conditions and may not be fulfilled in practice when studying information systems in general. Moreover, the proposed model implies that time savings equal a better service and that the users of the public e-services have an income.

Factoring the time citizens save by the online services as a product of their annual income raises challenges for using the framework in assessment of e-services oriented towards citizens with limited/ no income and web services oriented towards, for example, homeland security and information about earthquakes etc. Thus, we encourage future studies to expand the number of variables included in the framework in order to provide a more comprehensive picture of the cost and impacts.

There is a need for furthering the refinement and use of cost-benefit analysis. Computing in government is widely regarded as a *current expenditure* and as "a well established budget item within most governments", grounded in the uptake of computing in government since the 1970s [10]. Using monetary variables and time variables as the representations of savings is one dimension that needs further studies in order to improve the measurement and studies of cost-benefit of front-end services and help guide IT investments in government.

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Building a Value-Centric e-Government Service Framework Based on a Business Model Perspective

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Abstract. The main objective of e-government is to create public values by delivering public services to citizens, businesses, and government agencies. Since business models have been noted as proper means to illustrate the concept and methods of value proposition and creation, the aims of this paper is at proposing a value-centric e-government service framework based on the business model perspective for guiding and ensuring successful development, management, and delivery of e-government systems and services. Four adapted value-centric business model perspectives include public beneficiaries, government internal organization and process, government service chain, and society and national environments. Identified generic e-government service functions encompass profile management, security and trust management, information navigation and search, transaction and payment, participation and collaboration, personalization and customization, as well as learning and knowledge management.

1 Introduction

In recent years, strategic views, system environments, and operational processes for business and government administration have changed rapidly due to the fast advancement of web-based technologies and applications. From the technological aspect, web services and e-services have been considered as fundamental instruments for facilitating the development and implementation of e-business (EB) and e-government (EG) applications [4,22]. From the managerial aspect, the design and adoption of an appropriate business model (BM) has emerged as a critical success factor for assuring better business and government performances [1,11]. In the e-business literature, a business model is often defined as an architecture for the product, service and information flows, as well as business actors, potential benefits, and sources of revenues [23], or viewed as a method for managing resources to provide better customer values and make profits [1]. Since the purpose of designing and applying business models is to create values for customers as well as stakeholders, value is often noted as a core component of the business model and a measurement construct of business performances [7,24]. In addition, it has also been pointed out that for realizing the effectiveness of web services coordination in e-business, it is necessary to take a viewpoint from the business model aspect [22]. In this context, business modeling and value creation for developing and delivering e-services have been addressed as critical issues and central tasks in strategic and

operations management of e-business. In the e-government literature, on the other hand, the aims of e-government initiatives have been set to provide one-stop quality public services and value-added information to citizens and businesses, to enable government agencies working together more efficiently, and to achieve internal efficiency and effectiveness of operations [16,25]. Creating public value and trust has been identified as a strategic goal for designing e-government systems [8]. Applying e-service technologies has been indicated as a unique opportunity to transform government strategies into innovative public services [18]. And adopting a proper business model has been considered as a means to facilitate knowledge acquiring and sharing that improves the business and coordination logics of offering new web-based services [11]. However, although issues regarding EG related public value, business model, and e-services have attracted certain attention and been explored respectively, no relationships among values, business models, and e-government services have been structurally illustrated and sufficiently discussed yet. As a result, there is a strong need in the e-government domain, as in the e-business domain, to provide a conceptual framework for coordinating e-government services and business models to facilitate public value creation. To meet the research demand, the goal of this paper is to build a value-centric e-service framework based on the business model perspective for efficiently guiding the development and management of e-government service systems and for effectively ensuring public services delivery and values creation. The rest of this paper is organized as follows. In section 2, a brief literature review on e-government related services, values, business models, and performance measurement is provided. In section 3, an integrated value-centric e-government services framework based on business models is proposed with specified value types, service functions, strategic objectives, as well as performance indicators. In the final section, a conclusion and future research directions are provided.

2   Literature Review

A brief review of the research literature regarding e-government services, values, business models, and performance measurement issues is provided in this section.

2.1   e-Government Services

The core concept of e-government is to apply Internet and Web technologies in an innovative way to deliver public services, engage citizens, and improve performances. In a common list of 20 basic public services defined by the eEurope Initiative [6], 12 services identified for citizens include Income taxes, Job search, Social security contributions, Personal documents, Car registration, Application for building permission, Declaration to the police, Public libraries, Certificates, Enrollment in higher education, Announcement of moving, and Health related services, while 8 services presented for businesses are Social contribution for employees, Corporation tax, Value added tax, Registration of a new company, Submission of data to statistical offices, Custom declarations, Environment-related permits, and Public procurement. By reviewing relationships among governments and private as well as nonprofit organizations in the regions of US, Canada, and Europe, Dawes and Prefontaine (2003) identify a set of public service domains of collaboration that includes tax

processing, workers compensation insurance, business start-ups, tourist information, and portal-type Internet services for public access to organizations [5]. Three types of collaboration including public-private, public-public, and public-public-nonprofit-private are identified with associated service. Lee, Tan, and Trimi (2005), in their work of conducting a cross-national comparison of current e-government practices among leading countries, classify e-government services and practices into five categories, namely, Government-to-Citizens (G2C), Government-to-Businesses (G2B), Government-to-Government (G2G), Government Internal Efficiency and Effectiveness (IEE), and Overarching Infrastructure (Cross-cutting) [16]. Some sub-categories such as vertical and horizontal integration for G2G, government to employee and integrating internal systems for IEE, are also presented. Charalabidis et al. (2006) emphasize the need of a complete taxonomy for classifying Municipal e-services [4]. Based on the 20 basic public services adopted by European Commission and country initiatives within the European research space, they present 7 Municipality e-Service categories: News and Announcements, Municipality Organization Information, Municipal Information for the Public, Services to Citizens (Citizen Registry, Land Registry, Security, Employment, etc), Services to Businesses (Registrations, Permits and Certificates, Local Taxes, Public Procurement), Participated Services for Citizens (Meeting Officials, Forums, Voting), and Information and Knowledge Discovery Services. In a case study of Singapore's e-government programs, Ke and Wei (2004) identify three stages of the city-state's EG development, namely, initiation, infusion, and customization [14]. The customization stage aims at maximizing the value of e-government to citizens by implementing customer relationship management (CRM) techniques and adopting certain collaboration mechanisms that are capable of maintaining personal profiles of citizen interactions, facilitating seamless integration of front-end applications and back-end systems, as well as providing authentication, payment, and personalized e-library services. When exploring the future of CRM in UK local governments, King (2007) indicates 3 new relationships between local authorities and citizens that focus on delivering customer-centric public services [15]. The informational/transactional relationship aims at supporting citizens' transactional inquiries. The second relationship is council-driven that focuses on reducing cost incurred to the council by segmenting citizens and improving targeted citizens' use of services. The third customer-centric relationship illustrates the use of community services to enable citizens for accessing more public services and participating in service design. Taking a more technique-oriented view, Kaliontzoglou et al (2005) propose an architecture of a secure e-government platform for small-to-medium sized public organizations based on web services [12]. The architecture comprises five major groups of services including Core web services, User interfaces, Security services, Legacy applications support, and Web services management. Service description, directory publishing and operating are based on Web Service Description Language (WSDL) and Universal Description, Discovery, and Integration Protocol (UDDI) technologies. Services requests are sent by Simple Object Access Protocol (SOAP) messages and service outcome deliveries are based on eXtended Markup Language (XML) documents. In addition to research works mentioned above, there are also a few papers focus especially on issues related to interoperability, inter-organizational systems, personalization, and security, etc [9,10,20,21].

2.2   e-Government Values and Business Models

In the e-business domain, value proposition and creation issues have been addressed from various perspectives including business, customer, supply chain, and market dimensions. Value types identified by previous works include business value, customer value, relationship value (such as manufacturer-supplier value), product value, supply chain value, etc [7,25]. Values can be assessed by adopting a variety of financial and non-monetary measurement metrics and indicators. In the e-government literature, research efforts focusing on value related topics are still in the initial stage. Although getting citizen, organizational, institutional and/or stakeholder values has been considered fundamental to underpin government strategies, no sufficient discussions upon value identification, proposition, assessment, and creation issues has been provided [17]. Among very limited works in this area, Ke and Wei (2004) point out that a high-level structure should be set up to identify key areas of value creation, to spearhead e-government development, and to elicit value-added e-services from intra- or interagency system integration [14]. Grimsley and Meehan (2007), towards developing an evaluative design framework for EG information system projects, argue that public value should focus on citizens' and clients' experiences of service provision and service outcomes that contribute to the formulation of public trust [8]. They then use well-informedness, personal control, and influence as evaluative measures of satisfaction and trust. In the paper proposing a value-based strategic management process, Yu (2007) identifies a set of EG related values including service values, citizen values, business values, government employee values, organizational values, institutional values, administration values, society values and nation values [26]. He further classifies these values into five dimensions, namely, services, public users, government agencies and processes, government service chain, as well as national and global environment. Value metrics mentioned for the services dimension consist of quality, efficiency, effectiveness, and trust.

As for the research focusing on business models, in the EB domain, Business-to-Consumer (B2C), Business-to-Business (B2B), and Consumer-to-Consumer (C2C), e-shop, e-procurement, e-auction, virtual communities, value chain integrator, etc are commonly used as BM types to underline business actors and functions. Furthermore, as for component structure of the business model, many BM related elements identified include value, scope, revenue sources, price, connected activities, implementation, capabilities, sustainability, as well as linkages and dynamics [1,23]. Besides, in an attempt of coordinating web services based on business models, Terai, Izumi, and Yamaguchi (2003) represent BM as a structure of business activities [22]. They map business tasks to business processes and then execute business processes by matching business process execution module to web service invocation module. In the EG literature, the BM related issues are still considered as an unexplored area. Most commonly, Government-to-Citizen (G2C), Government-to-Business (G2B), and Government-to-Government (G2G) have been classified as EG specific BM types, just similar to B2C, B2B, and C2C being identified in EB [16]. In addition to this type of simple classification, Janssen and Kuk (2007) propose a EG-applicable BM framework comprising of 6 elements, namely, organizations in the public service network, service offerings, network coordination, business processes, shared resources, and network capabilities [11]. They then use this framework to analyze 3 e-government BM types including portal, orchestration, and shared services business

models. Yu (2007), instead, adapts the balanced scorecard (BSC) concept to illustrate value-based business model perspectives for e-government [26]. The 4 dimensional BM perspectives encompass public beneficiaries, government structure and process, government service chain, as well as national and global environment. The core components of the business model are values and services.

2.3   Performance Measurement in e-Government

Quality assessment and performance measurement of e-government services, although largely noted as key issues, is still a white spot regarding the research outcome in the literature. By examining e-government service take-up in Austria, Aichlozer (2005) identifies a set of impact elements in quantitative and qualitative terms including reduced process times, improved service, reduced administrative burden, increased efficiency, adaptation problems and reorganization, cost reductions and enhanced revenues [2]. In a summary of the literature related to quality of e-government services, Papadomichelaki et al (2006) organize main influential quality-related components into four key areas: service, content, system and organization [19]. In the service key area, major concerns on service quality are accuracy, consistency, in time, interaction, trust, and degree of personalization. Specifically dealing with the performance evaluation issue, Montagna (2005) presents a dimension-criterion framework for the assessment of e-government proposals [18]. In this framework, five dimensions including product, time, distance, interaction and procedures are used to characterize the EG proposals, and each of these dimensions can be evaluated in terms of four criteria consisting of efficiency, effectiveness, strategic benefits, and transparency and institutional value. As for performance measurement instruments in the government sector, the Balanced Scorecard has been adopted in a relatively larger scale by the UK, US and Canada for measuring performance of local and municipal governments [3,17]. The BSC, proposed by Kaplan and Norton (1996), is a strategic and performance management instrument that can be used to measure business performance from four perspectives: financial, internal process, customer, and learning and growth [13]. In an exploratory study of the effectiveness of using the BSC for Best Value implementation in UK local governments, McAdam and Walker (2003) point out the need to develop a strategic framework for establishing linkages within and between the BSC perspectives in order to ensure the proper adaptation of the BSC to the public sector contexts [17]. In a survey of the BSC adoption to municipal governments in USA and Canada, Chan (2004) indicates that since the BSC is a fairly new management tool in municipal governments, it may be premature to assess its usefulness on strategic and performance management, and therefore, more studies on the role and benefits of the BSC in the public sector are needed [3].

3   The Value-Centric e-Government Service Framework

In response to research demands addressed in the literature, we organize EG services based on business models to coordinate values, processes, strategic objectives, and performance measures in multiple EG related user and system dimensions. In our proposed BM-based value-centric e-government service framework, a broader

scope of BM is taken to include key components such as services, values, users (citizens, businesses, and government agencies), the service-oriented value chain, intra- and inter-organizational structures and processes, as well as society participation and national learning environments. Using this business model perspective, we then adopt and adapt the BSC to include 4 new dimensional views for planning and evaluating e-government services, namely, public beneficiaries, government internal organizations and processes, government service chain, as well as society and national environments. Research activities and outcomes in the process of building the value-centric EG service framework based on BM perspectives are described in the following subsections.

3.1 The Value-Centric Business Model Perspectives

EG related values identified within the aforementioned four BSC-based BM perspectives include service values, citizen values, business values, government employee values, organization values, service chain values, institution values, administration values, society values, and nation values. Figure 1 depicts the value-centric service model based on these BM perspectives. Perspective-associated values, users, systems, and application-level services are grouped and presented below.

The Public Beneficiaries Perspective

For citizens as public beneficiaries, values to be created are citizen values. The EG system type is G2C in national, municipal, or local levels. Service categories include news and announcement, multi-level government information, job offers, tourist information, public library access, tax processing, registration and certification (birth, marriage, car, land and other properties), permit application (e.g. driver license, passport), booking and reservation (courses, tours, healthcare, etc), social security contribution and welfare compensation, payment processing, personal file maintenance
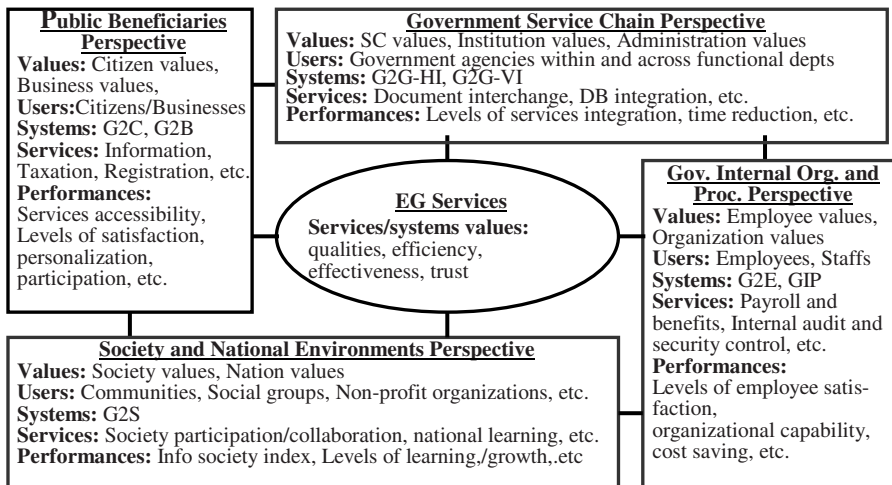
Fig. 1. Value-centric service model based on BM perspectives

(address, email), forum and meeting participation, online voting, authentication and certificate authorization, etc. For businesses as public beneficiaries, values to be created are business values. The system type is multi-level G2B. Business-related service categories include news and announcement, multi-level government information, tax processing (e.g. corporation tax, VAT), registration and certification (new company, business properties), permit application (construction project, environment related development), social contribution for employees, payment processing, business profile maintenance, business data submission (financial statements), customs declarations, public procurement, business clustering, authentication and certificate authorization, etc.

The Government Internal Organization and Process Perspective
For employees as users of the G2E system, the objective is to create government employee values. For facilitating intra-organizational processes, the system can be noted as GIP (government internal process), and associated value type is organization value. Employee related service categories include payroll and benefits, education and training, employee profile maintenance, etc. On the other hand, organization related service categories include organization profile management, internal communication and collaboration (email, bulletin board, video conferencing, etc), document interchange and approval, information and knowledge management, recruitment and human resource integration, integrated access to organizational databases and applications, internal audit and security control, etc.

The Government Service Chain Perspective
The government service chain handles two types of integration, namely, the vertical service integration and the horizontal service integration. User parties involved are inter-organizational government agencies within and across national government institutions. Systems associated with vertical and horizontal government service integration are denoted as G2G-VI and G2G-HI, and values to be created are institution values and administration values respectively. Service categories offered by the G2G-VI and G2G-HI systems include shared databases within and across functions/levels of government agencies, inter-departmental communication and collaboration, coordinating and join purchases, inter-organizational document interchange and approval, integrated information and knowledge management, integrated budget and financial management, integrated personnel administration, inter-organizational security control, etc.

The Society and National Environments Perspective
In this perspective, the aim is to reduce digital divide, create digital opportunity, facilitate society participation, strengthen information society maturity, leverage national capability, and sustain world competitiveness. Values to be created include society values and nation values. User groups involve schools, communities, non-profit organizations, and special interest groups (SIGs), etc. The society-focused system is classified as G2S. Service categories provided by the system include social group profile management, society participation and collaboration to public issues, registration/certification and information for specific-interest social groups, status reports of government projects (e.g. digital divide, digital opportunity), business models and beat practices of social-economical development, national learning and

innovation, analysis reports of global development and competitiveness, national standards reports, national public key management and certificate authorization, etc.

3.2   The Value-Centric EG Service Framework

By generalizing application-level EG services for different user groups in various BM perspectives, and incorporating innovative services such as personalization and collaboration addressed in recent works, we propose a value-centric EG service framework as shown in figure 2. In this framework, generic e-service functions include profile management, security and trust management, information navigation and search, transaction and payment, participation and collaboration, personalization and customization, and learning and knowledge management.

Profile Management Services: Services provided in this functional group enable users to create and maintain their multi-dimensional personal/business/SIG profiles including basic information and specific interests.

Security and Trust Management Services: Security management services include public key management, certificate authorization, digital signature and authentication, as well as other security control services. Trust management services, on the other hand, allow citizens, businesses, government agencies to register and attain authorized trust seals and certificates, as well as to access privacy statements. The aim is to ensure secure transactions and interactions between participants.

Navigation and Search Services: These services provide citizen, business, or social group users with navigation and search mechanisms to retrieve and browse multi-functional, multi-level public information based on guide-tours, categorized service
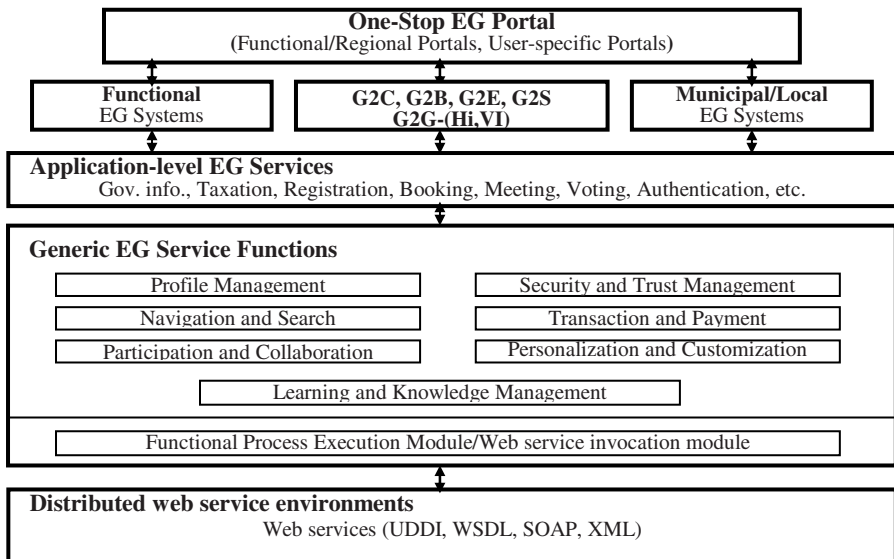
Fig. 2. Value-centric EG service framework

catalogues, government functions and levels, or on search methods using keywords, attributes, or full text.

Transaction and Payment Services: This service function allows users to activate one-way or two-way transactions with the government, such as applying driver license, registering new business, tax processing, and participating in public procurement. Also provided are payment services to allow users securely transferring payment in different ways. In addition, notification and tracking services within this function allow users of both sides to notify and track transaction status.

Participation and Collaboration Services: The functional services allow customers to form special interest groups and virtual communities, to set up community forums and meetings, to participate in the planning of social development project, to collaboratively work on specific subjects and make group decisions. Network conferencing, proposal submission, online voting, etc are associated service mechanisms. Other business-oriented services in this group consist of public procurement participation, auction, and contract negotiation services.

Personalization and Customization Services: This service function focuses on meeting users' needs of government services and increasing their satisfaction on service values and qualities. Through interactive steps, users can specify personalized needs and form a service process by bundling and sequencing desired services. Examples include recommendations of proper tourist plans, learning materials, or tax filing and payment methods for meeting personalized conditions, needs and preferences. Also available in this service group are facilities for creating personalized web pages along with subject directories, bookmarks, and annotations.

Learning and Knowledge Management Services: Learning and knowledge management services in organizational and national levels are included in this functional group. Also included are data and document sharing, and e-library services.

Using web browsers and making choices through the user interfaces of the one-stop EG portal, users can access specific application-level e-government services from either user-oriented (e.g. G2C, G2B, G2S) or function/level-oriented (e.g. internal affairs, economic affairs, municipal, local) systems. To execute a specific application level service, the corresponding generic functional process is activated, and subsequently, the associated web services are invoked to fulfill the required database retrieval and application processing operations. Directory publishing, service description, service request, and service outcome presentation for web services are based on UDDI, WSDL, SOAP, and XML.

3.3   Value Creation and Performance Evaluation

Measurement dimensions for assessing service values consist of quality (consistency, accuracy, timely, innovation, etc.), efficiency (24x7, location, process, interaction, transparency, etc.), effectiveness (personalization, collaboration, satisfaction, benefits, cost savings, etc.), and trust (confidence, support, etc.). For the public beneficiaries perspective, strategic objectives include to provide easy access to EG systems and services, to deliver citizen and business desired information and services, to enforce

personalization and customization in EG services, to provide more community, collaborative, and participative services, to enhance public relationship management, to provide a security and trust service environment. Public associated performance indicators may include number of registered public users (citizens/businesses), cost and time for requesting and receiving services, EG maturity and usage indexes, levels of personalization, collaboration, and participation, levels of public satisfaction on quality, efficiency, effectiveness, trust, and completeness of EG services. For the government internal organization and process perspective, strategic objectives include to set up employee communication, collaboration and learning channels, to leverage organizational capabilities on service development, operation and knowledge management, to improve internal operational processes, to increase organizational productivity, to reduce operational costs, to achieve service/decision effectiveness, to create organizational image and awareness, to develop and deliver innovative and value-added services. And accordingly, the performance indicators include HR skill levels and productivity ratios, level of employee satisfaction, level of organizational capabilities, levels of Internal operating efficiency and effectiveness, level of cost savings, levels of service innovation and utilization, levels of public satisfaction on agencies (local and municipal) and their services. For the government service chain perspective, strategic objectives include to establish vertical and horizontal government service chains, to enhance service chain management and operations, to develop information and value sharing policies, to facilitate inter-organizational service integration and delivery processes. Performance indicators associated with these service chain objectives include quality and response time to user-requested integrated services, cost and time reductions in inter-organizational information and transaction processing, levels of inter-organizational services integration and operational transparency, levels of benefit generation and cost reduction for service chain participants and the entire government service chain, levels of public satisfaction on time/location conveniences and output qualities of integrated services. For the society and national environments perspective, strategic objectives specified include to establish EG related national information infrastructure and one-stop service portal, to set up a nation-wide e-learning environment, to close digital divides, to sustain national economic growth, to leverage national capability, to achieve high level information society readiness, to sustain high level world competitiveness, etc. Associated performance indicators include digital divide status, information society index, world competitiveness index, levels of completeness, usefulness, ease-to-use, and security of one-stop EG service portal, levels of national learning, innovation, and growth, levels of budget efficiency and effectiveness, and return on investment (ROI), etc.

4   Conclusion

In this paper, we present a novel and complete value-centric e-government service framework based on business model perspectives. Adapted from the BSC methods, four EG related business model perspectives encompass public beneficiaries, government internal organizations and processes, government service chain, as well as society and national environments. Perspective-based BM components include values, users, service functions and systems, and performance measures. Through the

creation and delivery of service values to users of different EG service systems, values such as citizen and business values, government employee and organization values, government service chain values, and society and nation values can then be created and distributed. The proposed EG service framework can serve as a guideline for efficiently and effectively planning, implementing, and evaluating e-government services and systems. Future research works include validating the proposed EG service framework and associated performance measures by conducting interviews, focus group discussions, and case studies.

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Unity in Diversity: An Analysis of Inter-governmental Cooperation in the Field of geoICT

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Abstract. Despite consecutive policies towards Joined-up government in the Netherlands, cooperation in the public sector with ICT is still considered problematic. The effects are often considered insufficiently visible or even considered absent. The domain of geoICT has various examples of cooperative activities, often intertwined with E-government programmes. The gap between policies and practice is investigated in this domain of geoICT. An exploratory, hermeneutic approach, supported by a quantitative survey is employed to research this gap. This approach has provided an insight in the dynamics and in which factors play a role. Not the technology in the cooperation or the structures in which the organizations work are important in how the cooperation with geoICT is shaping and evolving, but the degree to which the actors can maintain their own role. Finally, there is a disconnect between societal cooperation and cooperation with technology.

Keywords: G2G, inter-organizational cooperation, geo-information, geoICT.

1 Introduction

For the past ten years the Dutch government has planned for improved inter-agency cooperation. Five different succeeding coalitions of national government promised to construct new forms of public administration which would be more service-oriented, more efficient, more integrated, more chained, more transparent, and most of all more cooperative. The Dutch followed hereby an international trend of promoting New Public Management (NPM) together with Joined-Up Government (JUG), whereby improving efficiency and efficacy in governance was supposed to go hand-in-hand with the uptake of electronic means for public services, the reform of routine work processes through office integration, and the construction of public agencies as seamless parts of a public information infrastructure.

What these discussions on NPM and JUG have had in common is the concern for efficiency and quality of public service delivery, amongst others through alternative forms of cooperation between the public organizations. [1] argues that E-government (EGov) has been largely shaped by the ideology of NPM *"NPM sees in e-government the foundation for new forms of communication and -deriving from that - new forms of*

organization for public institutions and their stakeholders. Building upon the NPM agenda, e-government is primarily motivated by the need for an improvement in the quality of the provision of more services and more generally by the need of a more efficient process of managing the PA.". [2] notes that both ICT-related (which are often found within a context of digital or electronic government) and NPM related discussions address the same problems, but that the concepts behind these discussions are quite different. The difference is that the former have tended to focus on the technological tools of improving the efficiency and cooperation, whereas NPM discussions have tended to be more related to alternative forms of organization and coordination, such as structural devolution, disaggregation, and single purpose organizations.

Both of these discussions have had an effect on how government policies have been formulated. The degree to which such policies were realized is however variable, and whether JUG, EGov or NPM have actually (fundamentally) reformed the public sector – given the expectations that such policies create - remains a research dilemma. A reality check shows that many forms of government cooperation and integration are described and felt as problematic, and that the uptake of ICT within government agencies is far from ideal. A number of reports in the Netherlands indicate that "*there is a wide gap between intentions expressed in policy documents, and the experiences of the shop floor*". [3]. A recent report [4] also provides a number of reasons why many ICT projects within the public sector seem to fail and why they are more complex than anticipated. In other countries there are similar sentiments. [5] notes for example that for the case of Brazil that: "*Government-to-government (G2G) endeavours led to outcomes that fell short of those expected*".

In light of this discussion on the gap between de facto implementation trajectories of JUG and Egov as compared to the planned ones, this research aimed to investigate the actual practice of cooperation and integration. In contrast to the discussions aiming for dichotomous conclusions (namely to distract either fail or success factors or projects), this research should lead to an insight in the degree to which public sector integration in the field of geoICT is taking place. This field of geoICT was chosen because GeoICT is traditionally produced and utilized within the realm of the public sector and with public objectives, and that it forms an intrinsic part of EGov programmes. It can be described as the subset of ICT which allows the study of natural and man-made phenomena with an explicit bearing in space [6].

In addition to verifying the extent to which geoICT is used in inter-governmental cooperation activities, a main aim is to derive what could be the driving factors in the dynamics of public sector cooperation with geoICT, and to verify whether these factors are in accordance with or different than the JUG, EGov or NPM objectives. This article describes first the background against which this was investigated, followed by the route of how this was done, and finally what the results have been. A discussion on these results concludes the article.

2   Research Framework

2.1   Research Approach – Focus on Interplay

Unraveling causes and effects in a dynamic picture of JUG and Egov reality is complex, because of the high number of variables which may play a role. In fact, [7]

note that in many cases where ICT was used to support EGov initiatives, the outcome could be explained simultaneously from two angles: because ICT has developed autonomously (deterministic view) and because ICT has enabled development (voluntaristic view). In other words, the instruments to unravel ICT in such projects are insufficient or inappropriate. Yet, what is common in both explanations is that "*the outcomes are greatly influenced by the specific setting in which ICT has been developed, introduced and implemented.*" [7]. A better understanding needs therefore a view, which assumes the co-evolution of different kinds of environments, or using the terminology of [8], an information ecological approach towards studying G2G. In such an approach there are no causes and effects directly observable, but there is interplay of actors in and with their environment. Studying this interplay should generate an insight in the active forces, drivers and dynamics.

Table 1. Questions per issue

Issue	Questions
Technology in use	How are decisions on geoICT made? Is cooperation resulting in or preventing harmonization of geoICT among cooperation partners? Is geoICT sufficiently open and flexible for cooperation partners? Does *open source software* have any influence on the way that organizations cooperate with geoICT?
Organizational Policies in use	Are organizations paying (increasingly) particular attention to geoICT – for example through dedicated geoICT departments, or dedicated geoICT staff? How has geoICT cooperation changed the respective organizations?
Cooperation structures	Are public organizations actively engaging in cooperation, and what sort of structures have emerged? Can such structures be explained?
Control and steering	Which national or representative organizations play an active role in coordination of cooperation for geoinformation?
Evaluation	Does cooperation leads to improved efficiencies (i.e. lower internal costs, or lower transaction cost)? How is this felt? How is cooperation different at different administrative levels, and does cross-administrative cooperation lead to more integration?
Environment	Which external changes (laws, technology, data availability, etc.) have had an influence of cooperation with geoICT? Do E-Gov programs related to cooperation with geoICT have a different impact as other government programs? Which societal problems influence cooperation with geoICT?

This interplay can be studied by specifically looking at the interplay of (following the approach of [7, 9]):

1) Technology in use
2) Organizational policies in use
3) Cooperation in use, i.e. the current structures and forms of cooperation
4) Control and steering mechanisms in use, or perceived
5) Evaluation mechanism in use and/or perceived
6) Extent of environment – forces which are perceived having an influence

2.2 Specific Research Questions

The research question aims to reflect on the status quo of cooperation with geoICT, the possible patterns that are and might emerge, and how these patterns could be explained. Additionally, it aims to verify how one could continue the research, to further interpret and explain the findings and the patterns. This resulted in the following sets of specific research questions, as in Table 1.

3 Method

Because of the exploratory nature of the research a three steps hermeneutic and inductive approach was taken, following [10], which consisted of:

1) Exploratory interviews with professionals who work daily in geoICT related cooperation programs and projects. These interviews applied an open structure, whereby the discussion focused on exploration (rather than explanation) of actual practices, and perceptions of relevant drivers.
2) Interactive workshop. The interview results were the basis for a workshop with a group of professionals, academics and policy makers in the field of geoICT. Aim of the workshop was to assess the practices and prospects of cooperation with geoICT. This was done through a set of 20 pairs of propositions, whereby the participants were asked to indicate the degree of their preference for either proposition. This process identified a list of common and varying opinions and experiences. This list was used in the further steps of the research. Figure 1 shows an example of two results for one proposition.
3) Internet survey. Based on the workshop findings an online questionnaire was designed using the free software of surveymonkey[1]. The issues arising from the workshop derived the questions. These questions used exclusive responses where possible (e.g. class of work), dichotomous response possibilities (yes/no) for nominal control variables, and 3-point Likert scales for ordinal variables. A limited number of non-scale and open questions allowed on the one hand qualitative internal validation and consistency checks, and on the other hand possible explanation of results. The procedure was as follows: An email to general contact points prompted all intended respondents – including representatives from 441 municipalities, 12 provinces, 27 regional water boards, and 10 e-government advisors and coordinators.

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[1] www.surveymonkey.com
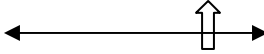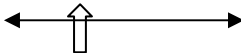
Proposition 1	Degree of preference and explanation	Proposition 2
In general, cooperation and exchange of data is just a matter of (practical) organizing.	It just a matter of complex negotiation processes; Dutch "poldering" Bilateral is easier. Yet, technically, in GeoICT one has to agree on 8 different definitions of addresses, for example.	In general, cooperation and exchange of data is a long, difficult and uncertain process.

Fig. 1. Sheet with responses to propositions

4 Results

4.1 Results from Exploratory Interviews

Technology in use
The interviews revealed that many were involved in different types of cooperation trajectories where geoICT played a role, and that there were distinct differences in how cooperative agreements were executed. Some people mentioned open source geoICT as potentially supportive for cooperation.

Organizational policies in use, and cooperation structures
The interviews showed that there were 3 categories of cooperation in the field of geoICT in the public sector:

1) Cooperation based on institutional arrangements. These are usually the result of long-term trajectories of legislation and regulation. Often, these forms of cooperation are also part of EGov programmes, whereby the contributing organizations have structured their operational processes to fit the use of geoICT or the production of geo-information. Examples include cadastral data processes, large-scale topographic mapping, land use planning.
2) Long and medium term project-based cooperation, where geoICT or geo-information exchange is the primary purpose of the cooperation. In such projects internal organizational processes of the participants in the cooperation are not completely stabilized yet, even though dedicated staff has already been assigned functional project tasks. Examples include national height data bases, or data on national underground infrastructures. Here, the form and formalization of cooperation is still an issue of negotiation.
3) Project-based cooperation, where geoICT is integrated in other ICT. Here geoICT is not the main purpose of the cooperation, but it is embedded and crucial for the outcome as a whole. Examples are projects dealing with location-based information for public safety, transport and mobility.

Furthermore, many organizations operate in an environment of consultative and representative structures, either based on professional common interest (e.g. geo-informatics professionals), or on associations of stakeholders (e.g. association of municipalities).

Control, steering and evaluation
Many interviewees felt that they had insufficient influence on coordination. In addition to the mismatch between national coordination and local coordination, the difficulties in handling geoICT standards were frequently mentioned.

Environment
EGov related projects seem to get an increasing impact in the implementation strategies of organizations. Many organizations also mentioned public safety and security as a key domain in which cooperation for geoICT could (start to) play a major role. Often, however, the societal environment and need appears insufficiently included in system designs.

4.2   Results from Workshop

The findings of this workshop are listed in Table 2:

Table 2. Workshop findings

Issue	Workshop findings
Technology in use	Open source geoICT is promoted by some organizations to enhance cooperation, but it is not really adopted. Open standards may support information exchange.
Organizational Policies in use	Integration of political processes is a condition before one can start with integration of information technical processes.
Cooperation structures	There is internal tension and skepticism towards authoritative and representative structures, while at the same time cooperation with geoICT is based on multi-level and multisector activities, which makes it complex technically, organizationally and politically.
Control and steering	The dilemmas of autonomy and dependency of organizations that arise out of cooperation are not properly understood. Most organizations would like to take autonomous decisions on their (geo)ICT, and engage autonomously in cooperation and geo-information exchange, yet they are at the same time forces by national legislation and national EGov programmes to streamline according to rules which were decided outside their organization.
Evaluation	The degree to which efficiency should be part of the objectives of cooperation varies.

Table 2. (*continued*)

Issue	Workshop findings
Environment	Societal problems, such as public safety, mobility and tax collection, are often insufficiently incorporated in the design and implementation of geoICT. Cooperation with geoICT does not mirror cooperation efforts for problems in society.

4.3   Results from Survey

Within two weeks after having received the invitation to participate 96 people responded. The type of respondents consisted of geoICT staff (61.5%), organizational managers and strategy advisors (35.6 %), and other staff or politicians (7.3%). Their relation to geoICT in indicated in Table 3:

Table 3. Relation of respondents to geoICT

Answer Options	Response Percent	Response Count
Works daily with geoICT	53.3%	49
Works occasionally with geoICT	28.3%	26
Knows about geoICT	18.5%	17
Does not deal with geoICT	2.2%	2
Skipped question	4	4
	answered question	**92**

4.3.1   Technology in Use

With regards to open source, only 4% of the respondents indicated that they knew that their organizations had signed an agreement to apply open source software. 37% of the respondents knew that their organization had not opted for open source. The majority however was not aware of any standpoint of their organization with regards to open source software, thus confirming earlier findings of the workshop. In general, open source does not play a role in integrating systems of municipalities, regional government organizations, and specific geoICT related cooperation agreements. Remarkable is perhaps that open source was only an issue in medium size municipalities (100,000-250,000 inhabitants), and not in the larger or smaller municipalities. This could be explained by two factors. Most of these municipalities indicate that they have sufficient capacity to develop and manage their own architecture and software requirements. Secondly, the larger municipalities rely on legacy systems, and have developed their own architectures independently, and are united in an exclusive group of leading municipalities [11].

4.3.2   Organizational Policies

From the reasonable number of geoICT staff who responded to the survey request one may conclude that there is an overall uptake of geoICT in government organizations. Moreover, all regional government offices indicated having a dedicated GIS department, while at municipal offices all had dedicated geoICT related activities and

staff. In all provinces, the geoICT has been incorporated in a series of reorganizations. There is no longer a unique identifiable geoICT department, but it is distributed departments which are different per province. This makes dedicated geoICT related cooperation problematic, and hence integration of geoICT among provinces, as well.

4.3.3 Cooperation Structures

The type of structures that were considered most useful for cooperation with geoICT were those that related to base registrations. The reason is probably that the requirements are fairly uniform for all participants, and that implementation is therefore "simply" following regulatory norms. On the other hand, vertical cooperation structures, especially in the field of physical planning, are not felt to be easier or stronger with the use of geoICT. Apparently, integration is easier for those parts of geoICT cooperation with uniform, often top-down, implementation processes and similar type of information requirements. As soon as context starts to play a role (as in the case of location-specific physical plans) cooperation becomes much more political, hence the structures become part of this political process.

When asked which organizations were perceived as having the biggest influence on the content and objectives of cooperative arrangements for geoICT, the results were as shown in Table 4.

The differences in response rates can be explained by the fact that not all respondents have a relation with every organization. Remarkable is the fact that the Ministry of Interior is believed to have little influence on cooperation structures, yet most of the EGov programmes are developed out of this Ministry. Also, the executing agencies are not perceived to influence any cooperative structures. This means that Egov is not perceived as a guiding force for cooperation. So, there seems to be a disconnect between those structures intended for technological standards and harmonization, and those (inter-organizational) structures that emerge out of practical needs. The latter are pragmatic cooperation structures which have led to opportunities to cooperate for other reasons than for specific geo-related problems.

Table 4. Degree of (perceived) influence on cooperative structure

	Lots of influence	No influence whatsoever	Response
Ministry of Housing, planning and environment	73.8% (59)	27.5% (22)	80
Ministry of Home Affairs	35.7% (25)	65.7% (46)	70
Implementing departments	8.8% (6)	91.2% (62)	68
Executing Agencies for Egov (ICTU)	20.3% (14)	81.2% (56)	69
National data collection organizations	57.9% (44)	43.4% (33)	76
Representative structures	36.8% 25)	64.7% (44)	68
Steering committees	64.9% (48)	35.1% (26)	74
Individual partners	60.5% (49)	42.0% (34)	81
Individual (Geo)ICT departments	66.7% (50)	36.0% (27)	75

4.3.4 Control and Steering

There does not seem to be a significant correlation between being actively involved in geoICT (Table 3) and the perception of influence on internal organization of geoICT. Apparently, it is felt by geoICT professionals that decisions on where, how and when geoICT should be embedded in the organization, are taken out of their sphere of influence, i.e. outside the geoICT department, or even outside the organization. This confirms the workshops findings.

Specifically for local governments, a serious dilemma remains whether they should implement policies themselves, or have it done through joined-up, representative or cooperative arrangements. The option of representation refers to the associations or cooperative structures between municipalities, provinces or water boards. These structures have a different function than the vertical columns, whereby municipalities are – for certain sectors – under the authority of regional provinces, and provinces under the authority of national ministries. The results of the survey show that in general the confidence in both representative and authoritative structures is rather low. On a 3-point Likert scale the results were as in Table 5:

Although not conclusive, some general remarks can be made. There seems to be more confidence in internal structures than in any other external structures, be it representative, authoritative or special, dedicated agreements. One could argue that this is line with [12], who claim that *the relationship between organizations and their environments is important, but at the same time, indeterminate. In other words, organizations are only loosely coupled with their environments. (p. 227).* The need for autonomous decisions is even stronger in regional authorities. They seem to have very little faith in representative structures for geoICT cooperation, hence de facto top-down steering and control to cooperate is very little, and joining up is reasoned from autonomous perspectives rather than from integrative perspectives.

What has perhaps not been taken into account sufficiently in this research is the effect of professional societies on cooperative structures. Individuals at all levels and in different organizations may have linkages through such professional societies, either formal or informal. These linkages may influence structures and structuring

Table 5. Confidence of local municipalities in representative, authoritative and autonomous structures to coordinate geoICT cooperation

	This works best for us	Not good, not bad	This does not work for us
VNG (Association of municipalities)	10.3% (6)	**65.5% (38)**	24.1% (14)
IPO (Association of provinces)	5.7% (3)	26.4% (14)	**67.9% (36)**
UWV (Assoc. of regional water boards)	4.0% (2)	14.0% (7)	**82.0% (41)**
Provinces	10.7% (6)	39.3% (22)	**50.0% (28)**
Ministries	9.1% (5)	**61.8% (34)**	29.1% (16)
Own municipality	**44.6% (25)**	44.6% (25)	10.7% (6)
Inter-municipal consultative structures	20.0% (11)	**50.9% (28)**	29.1% (16)
Special cooperation agreements	34.0% (18)	**49.1% (26)**	17.0% (9)
Programme E-municipalities (EGEM)	29.8% (17)	**50.9% (29)**	19.3% (11)

processes. On the other hand, no particular professional society or community was ever directly reported during interviews or in the responses, as having a major influence on cooperation.

4.3.5 Evaluation

Improved efficiencies

Some responses to questions on efficiency improvement perceptions are summarized in Table 6. The answers are not exclusive, but indicate roughly what people on the ground floor experience. Some argued that cost reduction is visible through joint license agreements. Others counterargued that most technological changes are supply-driven and thus increasing internal cost. In addition, the efficiency gains are only felt if implementation trajectories are completed, but the practice shows that there are continuous implementation trajectories which make efficiency evaluation rather difficult. The general response is given in Table 6.

Table 6. Did the geoICT cooperation lead to improved efficiencies in any way?

Answer Options	Response Percent	Response Count
Yes, and cost are clearly measurable	15.0%	9
Yes, but cost savings are not obvious	63.3%	38
No, because it induced new costs	21.7%	13
No, because the cost to cooperate are higher than without cooperation	5.0%	3

Influence of presence EGov projects

There seems to be a positive correlation between the presences of Egov projects at an organization with the perceived increase of efficiency (Spearman's Rho). Yet, at the same time, there also seems to be a positive correlation between presence of Egov projects and perceived increase in the amount of work. The results are in Table 7:

Table 7. Correlation Coefficient (based on Spearman's rho)

	Presence EGov projects
Dependent variable	
Perceived efficiency increase	.586(**)
Perceived increase in amount of work	.556(**)

** Correlation is significant at the 0.01 level (1-tailed).

4.3.6 Environment

Most respondents question seriously whether geoICT cooperation has contributed to any goals of NPM and JUG. Some 75% of the respondents indicated that it has only partly contributed to any of these goals. Specific goals such as less bureaucratization, more effectiveness, better government-citizens interactions and improved integration are not directly contributed to cooperation with geoICT, as shown in Table 8.

Table 8. geoICT cooperation has led to

geoICT cooperation has led to	Yes	partly	no
Relaxation of rules	3.6% (2)	69.6 % (39)	28.6% (16)
Improved connection to societal problems	9.1% (5)	78.2% (43)	16.4% (19)
Improved connection to needs of citizens	6.9% (4)	79.3% (46)	15.5% (9)
Improved integration within government	14.0% (8)	75.4% (43)	12.3% (7)

5   Conclusions

The following conclusions can be drawn:

o   Decisions on geoICT are often made through representative structures, yet there is a low degree of confidence in representative and authoritative structures for cooperation with geoICT.

o   There is little interplay between technological opportunities and cooperation structures, as the uptake of open source geoICT is low. Alternatively, open standards have facilitated information exchange, and could thus contribute to further integration.

o   Integration is only easier for those parts of geoICT cooperation with uniform, often top-down, implementation processes and similar type of information requirements. As soon as context starts to play a role (as in the case of location-specific physical plans) cooperation becomes much more political, hence the structures become part of this political process.

o   Egov is not perceived to having influence on revised or new cooperative structures in government. Pragmatic cooperation structures have led to other opportunities to cooperate in different fields. Cooperation is thus triggering other cooperation, not necessarily being integration.

o   Cooperative structures seem to arise while there is need for autonomy within the cooperative agreements and while coping with external dependencies. De facto top-down steering and control to cooperate is very little, and joining up is reasoned from autonomous perspectives rather than from integrative perspectives. One could question to which extent resource dependencies are a measure for the extent of influence on cooperative arrangements with geoICT.

o   Efficiency gains are sometimes perceived, yet the cooperative arrangements with geoICT also seem to increase the internal transaction costs.

Acknowledgements

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eElectioneering: Current Research Trends

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Abstract. Internet has transformed political campaigning during the last ten years. Political parties use it to attract, engage and motivate voters, while users use it to retrieve information and discuss political issues. Various tools have been used in such a way that nowadays electronic Electioneering (eElectioneering) practices vary significantly from traditional electioneering ones, e.g., by incorporating dynamic features and interactivity. At the same time, considerable research has been carried out, concerning account users' profiles, candidate and parties' profiles, various eElectioneering methods and tools and the recorded or possible effects of their use on the election result. In this paper a literature review is presented. Specifically, the results of the current research are identified, critically evaluated and categorized in order to define research trends and identify research gaps in the rapidly evolving field of eElectioneering.

Keywords: eElectioneering, eCampaigning, online political campaign, elections.

1 Introduction

Electioneering is defined as the political campaign of a candidate in order to be elected. It includes all the activities directed to the electorate from all the candidates. In most cases any available means of communication are used in order to spread out the message and persuade voters. Traditional electioneering involves communications through posters, flyers, speeches, and radio and television advertisements, and so on [1]. Research has been done in various topics concerning traditional electioneering practices, since electioneering is a major topic in political science [2]-[18].

In the recent past a new means of communication has made its appearance and since then has not been ignored: the Internet. On the contrary, Internet has become a very efficient means of political communication. Soon, several researchers presented studies on how Internet could be effective by surveying the tools used and their impact in various types of elections and also the electorate group they mostly affected taking into account demographic information. The present work summarizes a major part of the research related to the above fields, in order to define the research trends and identify possible gaps in that research. Particularly, the stakeholders, the tools and

the effects of eElectioneering are presented, the way they interacted with one another are studied and also the election cycles that have been analyzed are discussed.

The paper is organized as follows. In section II the methodology used for conducting this research is outlined. In section III the objects of research are presented along with the corresponding research. In section IV a short discussion of the results is taking place, and finally, in section V some conclusions are derived and future research is proposed.

2   Research Methodology

The methodology adopted to conduct this research is the one proposed by Webster and Watson [19]. According to it, a complete literature review should not be confined to one research methodology, or one set of journals, or one geographic region. It should be concept-centric and success in synthesizing the literature by proposing an appropriate organizing framework. In order to satisfy these requirements the present study defines an outline concept for eElectioneering, adopts a systematic search among the published work and presents a structured review of all the found relevant literature.

2.1   eElectioneering Outline Concept

eElectioneering is the political campaign of a candidate in order to be elected aided by Information and Communication Technologies (ICT). Accompanying the traditional electioneering communication methods, eElectioneering tools are used to establish new communication channels with the electorate in its whole, or with specific groups of it.

eElectioneering refers to applications and tools that aid the online political campaign prior to an election. All the other political practices supported by ICT, which are addressed to the electorate but are not followed by an election cycle, are not considered to be eElectioneering practices, as they can be classified in different fields of eParticipation, such as eConsultation and eGovernance.

2.2   Identification and Selection of Publications

In order to identify published work concerning eElectioneering, a list of articles dating back to 1997 was compiled from 3 databases (Scopus, Web of Science and Cite-Seer) using several combinations of 8 keywords. The keywords were "election", "online", "internet", "campaign", "blog", "candidate", "politic", and "websites". By this way, publications with a potential link to eElectioneering were identified.

The summaries of these publications were read and some publications were rejected since they were completely irrelevant to eElectioneering practices. Other articles concerned eVoting and ePolling and their associated technologies, thus they were also excluded from this study. Additionally, in many cases the identified articles contained abstracts that seemed to be relevant, but the full text of the paper was not available from the publishers. That concerned mainly older studies and resulted in the rejection of these articles.

The remaining publications were ordered and read, and the final selection of the articles used in this literature review was done using the following criteria:

- The article had to be published in English.
- The publications should be in recognized peer-reviewed journals or conference proceedings. Articles published in books, book chapters, news releases and other non-scientific articles were therefore not considered.

- Articles discussing other eParticipation practices were not considered. The distinction was made by selecting only research articles that referred to election cycles.

Finally, 47 articles were considered since only these were fulfilling all the above-mentioned criteria, while the rest were rejected. These papers were studied, summarized and categorized. The results are presented below.

2.3 The Analysis Framework

In order to categorize the research that has been done in the eElectioneering research field, an analysis grid was used to extract four major elements discussed in the selected articles:

- Stakeholders
- Tools
- Effects
- Election cycle

The interaction between the first three elements is depicted in Fig. 1, while the fourth one sets the time and place of the election cycle studied.

In respect to these elements, most of the research focused either on the profile of an element or on the interaction between two elements. In order to categorize the articles we defined for each article the scope of research. Articles that discussed the profile and the characteristics of one of the above-mentioned three elements were considered to be element-oriented research. Articles that focused on the relationships between the elements were considered to be relationship-oriented research. Additionally event-oriented research exists, which focuses on specific election periods.

The selected articles were categorized in respect to these scopes of research, and the results are presented below.
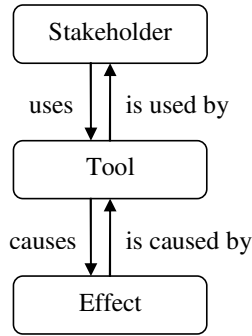
Fig. 1. The interaction between the major elements researched

3   Results

3.1 Element-Oriented Research

Stakeholders Identification. The basic stakeholders of eElectioneering practices were identified. These include the candidates, the political parties, and the voters/Internet users. Research has been done in defining the profile of each of these stakeholders, given in Table 1 along with the corresponding references.

Table 1. Stakeholders of eElectioneering

Stakeholder	Principal References
Candidates/ Political Parties	Gibson, Rommele and Ward (2003) [20], Ward and Gibson (2003) [21], Norris (2003) [22], Druckman, Kifer and Parkin (2007) [23], Gulati and Williams (2007) [24], Jackson (2007) [25], Rackaway (2007) [26], Xenos and Bennett (2007) [27]
Internet Users	Gibson, Ward and Lusoli (2003) [28], Johnson and Kaye (2003) [29], Norris (2003) [22], Tkach-Kawasaki (2003) [30], Farnsworth and Owen (2004) [31], Kaye and Johnson (2004) [32], Hindman (2005) [33], Howard (2005) [34], Kenski and Stroud (2006) [35], Krueger (2006) [36], Grönlund (2007) [37], Hooghe and Teepe (2007) [38]

Tools Identification. The tools used in eElectioneering are presented in Table 2, along with the respective references. These tools were adapted to eElectioneering practices but were not developed exclusively for them. Consequently, the research was not concerned with the development of new tools to support eElectioneering but rather on how existing tools were used for political purposes.

Table 2. eElectioneering Tools

Tool	Principal References
Websites	D'Alessio (1997) [39], Auty and Cowen (2001) [40], Johnson (2001) [41], Puopolo (2001) [42], Bowers-Brown and Gunter (2002) [43], Gibson, Römelle and Ward (2003) [20], Gibson, Ward and Lusoli (2003) [28], Norris (2003) [22], Kluver (2004) [44], Farmer and Fender (2005) [45], Lusoli and Ward (2005) [46], Schweizer (2005) [47], Souley and Wicks (2005) [48], Xenos and Foot (2005) [49], Kyj (2006) [50], Gulati and Williams (2007) [24], Xenos and Bennett (2007) [27], Druckman, Kifer and Parkin (2007) [23], Grönlund (2007) [37]
Profile Websites (PPWs)	Grönlund (2007) [37], Hooghe and Teepe (2007) [38]
Weblogs	Kerbel and Bloom (2005) [51], Lawson-Borders and Kirk (2005) [52], Jackson (2006) [53], Trammel (2006) [54], Stanyer (2007) [55], Trammell (2007) [56]
e-mail	Gibson, Rommele and Ward (2003) [20], Williams and Trammel (2005) [57], Krueger (2006) [36]
e-newsletter	Jackson and Lilleker (2007) [58]

Effects Identification. In Table 3 the major possible effects of the eElectioneering practices are presented along with principal references. Most of the research identifies the effects of eElectioneering to be focused on enhancing citizen involvement, engagement and mobilization, while other studies focus on the political knowledge that can be acquired through the use of eElectioneering practices.

Table 3. eElectioneering Effects

Possible effects	Principal References
Involvement	Kerbel and Bloom (2005) [51]
Mobilization	Krueger (2006) [36]
Political Knowledge/ Information	Farnsworth and Owen (2004) [31], Howard (2005) [34], Kenski and Stroud (2006) [35], Dalrymple and Scheufele (2007) [59], Grönlund (2007) [37]
Vote increase	D'Alessio (1997) [39]
Decision Making	Gibson and Rommele (2005) [60]

3.2   Relationship-Oriented Research

Stakeholder – Tool Relationship. Articles in this category examine the relationship between stakeholders and tools, and more precisely the way the former use the latter. In Table 4 the relationships explored are listed along with the relevant references.

Table 4. Stakeholder – Tool Relationships

Relationship	Principal References
Candidates using Web	Klotz (1998) [61], Auty and Cowen (2001) [40], Gibson, Margolis, Resnick and Ward (2003) [62], Gibson, Rommele and Ward (2003) [20], Gibson, Ward and Lusoli (2003) [28], Norris (2003) [22], Tkach-Kawasaki (2003) [30], Ward and Gibson (2003) [21], March (2004) [63], Farmer and Fender (2005) [45], Gibson and Rommele (2005) [60], Hindman (2005) [33], Schweizer (2005) [47], Druckman, Kifer and Parkin (2007) [23], Jackson (2007) [25], Rackaway (2007) [26], Sulkin, Moriarty and Hefner (2007) [64], Xenos and Bennett (2007) [27]
Users using PWWs	Grönlund (2007) [37], Hooghe and Teepe (2007) [38]
Users using Websites	Grönlund (2007) [37], Howard (2005) [34], Tewksbury (2006) [65]
Candidates using Weblogs	Jackson (2006) [53], Trammell (2007) [56]

Tool – Effect Relationship. Articles in this category examine the relationship between the tools used and the possible effects from their use. In Table 5 the relationships explored are listed along with relevant research.

3.3   Event-Oriented Research

A categorization has also been made to identify the countries and type of elections that have been studied in the past. These are presented in Table 6 along with the relevant references.

Table 5. Tool – Effect Relationships

Relationship	Principal References
Website tools for involvement	Bowers-Brown and Gunter (2002) [43], Gulati and Williams (2007) [24]
Website tools for engagement	Bowers-Brown and Gunter (2002) [43], Gulati and Williams (2007) [24]
Website tools for mobilization	Gulati and Williams (2007) [24]
Evaluation of political ads on the Internet	Kaid and Postelnicu (2005) [66]

Table 6. Countries and Election Cycles

Country	Election Cycle	Principal References
Belgium	2003 and 2004	Hooghe and Teepe (2007) [38]
U.S.A.	1996	D'Alessio (1997) [39], Klotz (1998) [61]
	2000	Gibson, Margolis, Resnick, and Ward (2003) [62], Kaid (2003) [66], Farnsworth and Owen (2004) [31], Kaye and Johnson (2004) [32], Farmer and Fender (2005) [45], Sulkin, Moriarty and Hefner (2007) [64]
	2002	Druckman, Kifer and Parkin (2007) [23], Xenos and Foot (2005) [49]
	2004	Hindman (2005) [33], Kaid and Postelnicu (2005) [66], Kerbel and Bloom (2005) [51], Souley and Wicks (2005) [48], Williams and Trammel (2005) [57], Trammell (2006) [54], Dalrymple and Scheufele (2007) [59], Druckman, Kifer and Parkin (2007) [23], Trammell (2007) [56]
	2006 Legislative	Rackaway (2007) [26]
	2006	Gulati and Williams (2007) [24]
Finland	2003	Grönlund (2007) [37]
UK	2001 General Election	Auty and Cowen (2001) [40], Bowers-Brown and Gunter (2002) [43], Gibson, Margolis, Resnick, and Ward (2003) [62], Ward and Gibson (2003) [21]
	2004 E.U. Parliament	Lusoli and Ward (2005) [46]
	2005 General Election	Jackson (2006) [53], Jackson (2007) [25], Stanyer (2007) [55]
Germany	2002	Schweizer (2005) [47], Gibson, Rommele and Ward (2003) [20]
Singapore	2001	Kluver (2004) [44]
Russia	1999	March (2004) [63]
Ukraine	2004 Presidential	Kyj (2006) [50]
Japan	2000 and 2001	Tkach-Kawasaki (2003) [30]

4   Discussion

In the previous section, the major categories of eElectrioneering research have been presented. In fact three major categories have been identified, that can describe the major research trends.

The first category consists of element-oriented research and includes articles that profile the stakeholders, the tools and the effects of eElectioneering. Most of the research concentrated on stakeholders and Internet tools.

By analyzing the political orientation of the candidates, the way that candidates use Internet tools and technologies, and also demographic information about candidates and political parties, research tried to connect Internet and political campaigning. Through demographic analyses and the logfiles of websites, many researchers try to profile the users and derive information about their opinion forming and the amount of their political knowledge.

Articles that examine Internet tools utilized by eElectioneering fail to evaluate tools such as forums, RSS feeds and also social networking applications such as Facebook, Second Life and YouTube. Web 2.0 technologies that made their appearance recently, like weblogs, seem to have excited researchers, shown by the recent research focusing on these technologies. All these Internet tools should be further investigated in order to fully examine their potential use.

On the other hand, eElectioneering effects can not be measured easily. Internet users already have their basic political opinions formed and mainly receive political messages from other means of communication rather than from the Internet. Thus, nobody can say whether the voting result depends on Internet use or on other means of political communications. Political opinion is formed by gathering political knowledge from many sources accessed by the majority of voters, while Internet users were a minority of the electorate until recently and in many countries even now.

In the second category, the relationships that connect stakeholders, tools and effects are examined. Research here concentrates on the use of Websites by the candidates and political parties. There have been many studies which examine the way candidates and political parties utilize their Websites, mostly through content analysis, while limited research concerns whether use of specific tools, like email, causes certain outcome, like political engagement and mobilization.

Some research focused on the way users access candidates' web sites and PWWs i.e. interactive sites that consult users what to vote, by matching users' opinions with candidates' manifestos. Further research might reveal useful information on users' behavior.

Finally, by examining the third category we conclude that researchers tend to study US and UK elections more than other countries' elections. This could be due to the major impact that these countries have in world politics and affairs. Even in countries that have high percentage of population using the Internet, like Finland, research is very limited. There have been some comparative studies, but their extent is limited to 3 or 4 countries.

Many of the selected articles do not concentrate on one of the above categories of research, but examine two or more of their sub-categories. For example there are many articles that examine the profile of candidates having a website along with candidates' websites content in one or two election cycles. Thus, the research is more complete and more valuable results can be derived.

5 Conclusion and Further Research

By examining the current research in the eElectioneering field we conclude that it focuses on the U.S.A. elections, on the candidates and on their websites. The other fields although partially examined, are not yet fully explored. Research should widen up in order to include other countries that use eElectioneering practices, stakeholders other than candidates, political parties and voters, e.g., non-partisan organizations, online newspapers, news portals and the government. In general, studies that combine the above-mentioned categories of research can be more useful than the examination of only one category.

Internet tools are rapidly evovling, so candidates and political parties have to be prompt in order to take advantage of them. The most recent example is the use of social networking Internet tools like Facebook and life simulators like Second Life. In the recent elections in the United States these tools seem to have a great impact since happenings in Second Life are discussed not only online but also through traditional means of communication, and politicians in Facebook make a huge people network just moments after their Facebook Sign Up.

Whether the impact of these above-mentioned tools will be so critical as to form political opinion and persuade voters are major questions and challenges to the campaign managers. The sure thing is that Internet has once and for all changed the way political campaigns are conducted and the way politicians approach voters. A major challenge is to study the impact of these new tools in the electoral process, as they seem not only to have a major impact in political discourse, but they also achieve to engage and mobilize the electorate.

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Using Online Public Services: A Measurement of Citizens' Operational, Formal, Information and Strategic Skills

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Abstract. It is important to take digital inequality research in consideration when focusing on electronic public service delivery. From this point of view, this paper considers four digital skills that citizens need when using online public services. Measurements of these skills in the Netherlands indicate that on average 80% of the operational skill Internet assignments, 72% of formal Internet skills assignments, 62% of the information Internet skills assignments and 25% of strategic Internet skills assignments have been successfully completed. Performances are significantly different for people with high, medium and low level of education attained and in some cases for people with different age. The Dutch government's expectation that every citizen with an Internet connection is able to complete the assignments clearly is not justified.

Keywords: digital skills, online public services, digital divide, citizens.

1 Introduction

An important research area on both the politic as scientific agenda is the divide between people that have and don't have access to computers and the internet [1]. While original research in this area mainly focused on a binary classification of access, now a more refined understanding exists, taking several other factors into account [e.g., 2, 3]. It is important that the extension of the concept of the digital divide beyond mere physical access to computers and the Internet gains more footing in the public sector, where the implications are major when access data appear more positive than they actually are. After all, many policy makers at the national and local levels of government think the access problem is solved as soon as the large majority of the population is connected. They tend to believe that the Internet already is a generally accessible channel for both citizen information and communication. This results in the online distribution of as much governmental information and services as possible. This policy, characterized by few barely funded presuppositions regarding what citizens want and can do [4], conflicts with research results that indicate that the internet is still not a general accessible channel. A possible result of this policy is that the use of electronic services lags behind with the demand in the public sector, as described by Van Deursen

et al. [4]. The use of more traditional service channels, like the telephone and service desks, remains the most important means of interaction, despite the efforts of the government to persuade citizens in using electronic rather than traditional channels [5]. Furthermore, many of the services 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 [6].

The observations described force the government to go beyond the obvious access data and focus on the more refined conceptualizations digital divide research has already outlined. This study considers one of the factors that appears to be important in all these refinements; digital skills. It is has been shown that these skills influence the take up of online government services [6]. Even when citizens have equal access to computers and the Internet, they may not have the skills to use the online public services offered to them. In the explanation of different usage of the Internet, the level of digital skills appears to be one of the most important factors. The problem of being short of skills becomes urgent when governments suppose that citizens are able to do about everything on the Internet. Policy advisors often believe that the problem of a lack of connectivity and participation will solve itself over time when the present, mainly elderly generation of computer illiterates has become extinct [7].

Very little scientific research has been done on the actual level of digital skills possessed by citizens. For using online public services it is non-existent. Measurements that are performed, took place in small educational settings or as a part of computer classes. Most important however is that almost every measurement of the actual level of digital skills has been done by survey questions asking respondents to estimate their own level of digital skills. This kind of measurement has significant problems of validity [8,9,10]. The only way to obtain a direct measure of a skill is by means of a test which measures that skill. A final remark is that most of the digital skill research uses a limited definition of these skills, not going beyond so-called 'button knowledge'.

The Netherlands is the second country of the world in broadband diffusion after South Korea. The general level of education is high and therefore digital skills are not expected to be a problem. The Dutch government pays a lot of attention to the supply of electronic services in order to make communication with citizens as effective, efficient and transparent as possible. This study provides an in-depth investigation of the Dutch citizens' skills when using online public services and public information, activities that relate to the concept of e-citizenship [11]. An in-depth digital skill investigation might help both the future development of eServices and formulation of public policies. The next section covers the research background and the framework used for measuring digital skills. Section 3 describes the methodology and section 4 presents the results. Finally, in section 5 conclusions are drawn.

2   Research Background

2.1   A Framework for Measuring Digital Skills

Unfortunately, there is no agreement on what constitutes digital skills or why they are required [12]. A lot of interpretations are given to a wide range of terms. This stipulates the need for more academic research to escape the simplification of early digital divide

research where only binary classifications of access were considered. A new simplification might appear: the simple duality of can's and can-nots. To prevent this duality, Van Deursen & Van Dijk [13] proposed a digital skill framework that is applicable in multiple digital domains. In the context described here, their framework considers:

- Operational skills: the skills to operate the Internet (browser).
- Formal skills: the skills to handle the special structures of digital media such as menus and hyperlinks.
- Information skills: the skills to search, select and evaluate information on the Internet.
- Strategic skills: the skills to employ the information contained in digital media as a means to reach a particular personal or professional goal.

We will apply this framework to measure citizens' digital skills. The following sections provide operational definitions.

2.2 Operational Skills

Useful operational definitions emphasizing operational skills are presented by Bunz [14] and Larsson [15]. Partly based on these definitions, Van Deursen & Van Dijk [13] defined operational skills as being able to:

- Operate an Internet browser:
  - Opening websites by entering the URL in the browser's location bar;
  - Surfing forward and backward between pages using the browser buttons;
  - Saving files on the Hard Disk;
  - Opening various common file formats (e.g., PDF, SWF);
  - Book marking websites;
  - Changing the browser's preferences (e.g., start page);
  - Using hyperlinks.
- Operate online search engines:
  - Entering keywords in the proper field;
  - Executing the search operation;
  - Opening search results in the search result lists.
- Complete online forms:
  - Using the different types of fields and buttons (e.g., drop-down menus);
  - Submitting a form.

2.3 Formal Skills

Van Deursen & Van Dijk [13] defined formal skills as the skills to use hypermedia (of which the Internet is the classic example). According to Gilster [16], hypermedia allows users to choose their own non-linear paths since graphics, audio, video, plain text and hyperlinks intertwine. In contrary, the old media are mostly linear which gives the users little control over the flow of information. On the internet, users cannot only move forward, but also backward and to unknown locations, referred to as cross-referencing. Cross-referencing enables the user to redirect the flow of information, but also characterizes a difficult problem for users of the Internet [17]. Without a

sense of location, distance, and necessary direction, it is not surprising that users often have a strong sense of disorientation [17]. Van Deursen & Van Dijk [13] consider the following indicators for measuring formal skills:

- Navigating on the Internet, by:
    - o Recognising and using hyperlinks (e.g., menu links, textual links, image links) in different menu and website lay-outs.
- Maintaining a sense of location while navigating on the internet, meaning:
    - o Not getting disoriented when surfing *within* a website;
    - o Not getting disoriented when surfing *between* websites;
    - o Not getting disoriented when browsing through, and opening search results.

2.4   Information Skills

There are a number of studies in information-seeking behavior that follow a staged approach to explain the search process. The model described by Marchionini [18] best suites digital environments. Taking cues from this model, the first relevant step is choosing a specific system, which depends on the information seeker's previous experience with the task domain, the scope of his/her personal information infrastructure, and the expectations about the answer that may have been formed [18]. After choosing a search system, a user formulates search queries. Selecting the most relevant results is the next step and often a difficult one. When only few search results are returned, they can be scanned quickly, browsed systematically, or inspected comprehensively. However, when people use broad search strategies in large-scale engines, a vast number of often unsuitable results will appear [19]. This problem is reinforced by the fact that information seekers often don't venture past the first page of the search result pages [e.g., 20, 21, 22]. Finally, the evaluation of information sources is considered. Information is not always of the same quality, calling upon specific skills that enable users to check the actual correctness of data and the reliability of the sources. Van Deursen & Van Dijk [13] consider the following indicators for measuring information skills:

- Locating required information, by:
    - o Choosing a search system or appropriate website to seek information;
    - o Defining search queries;
    - o Selecting information (on websites or in search results);
    - o Evaluating information sources.

2.5   Strategic Skills

The three types of skill discussed so far relate to an effective use of the internet. Strategic skills are related to the purpose of this use. Van Dijk [23] defines strategic skills as the capacity to use computer and network sources for particular goals and for the general goal of improving one's position in society. Although strategic skills will hardly depend on operational and formal skills alone, together with information skills they serve as the means to reach a particular goal by one's own initiative. In order to acquire strategic skills, users must be critical, analytical and must have a high degree of information skills. According to Van Deursen & Van Dijk [13], taking advantage

of the internet is a process that entails four steps. The first step is goal orientation. This means being aware of the opportunities the web offers and selecting one or more of these opportunities for a particular personal goal. Keeping an eye on this goal and acting towards this goal, is difficult and hard to learn, especially in a digital media landscape that offers an enormous amount of distracting stimuli. The second step is taking the right actions on the Internet. This means using the massive amount of information selectively and combining the various possible information sources. After the right actions are taken it is time to make decisions to reach the original goal by using the (often excessive amount of) information retrieved selectively. Making decisions is the third step and should be done by consulting the right information sources, relevant for work, study or personal life. The final step is gaining benefits on one or more of these areas. When the right decisions are made they can be turned into benefits of a personal, social, professional or educational nature.

Taking these four steps in consideration, Van Deursen & Van Dijk [13] consider the following subsequent indicators for measuring strategic skills:

- Taking advantage of the internet, by:
  - o An orientation towards a particular goal;
  - o Taking the right action to reach this goal;
  - o Making the right decision to reach this goal;
  - o Gaining the benefits belonging to this goal..

2.6 Research Questions

The problems described and the framework proposed lead to the following research questions:

- RQ 1: Do Dutch citizens have an adequate level of operational, formal, information and strategic skills to use online public information and services?
- RQ 2: Do these skill levels differ between citizens and in what respect?

3 Method

3.1 Subjects

Subjects were recruited in July 2007 by randomly dialing telephone numbers in villages and cities in the Twente region. Cities and villages were chosen according to a distribution that equals the national distribution of the Netherlands. A condition of invitation was that the participant acknowledged to use the internet at least once every month and for more than only using e-mail. Although this condition excluded around 20 percent of the Dutch population, it ensured that also low frequency users who are nonetheless familiar with the Internet are included. The invitation policy also made sure that not mainly 'computer lovers' accepted the invitation by reassuring people who feared the test. Subjects were promised 20 euros for their participation in a one and a half hour research session about their internet use and were assigned according to their availability (appointment).

Ultimately a number of 109 people performed the tests. To rate the overall representativeness of this sampling approach it should be compared more to the standards

of an experimental survey than a survey. Compared to the standards of an experiment the number is high. However, we think here bigger than average experimental groups are needed because we had to take into account the large social and cultural differences of computer use and experience that could be expected in the sample strata. The sample procedure followed a two step approach. As indicated, first a sample was randomly selected from the book/list of fixed telephony subscribers. Subsequently, a selective quota sample was drawn for the strata and quota of gender (51 male and 58 female), age (18-29: 25, 30-39: 27, 40-54: 27 and 55-80: 30) and educational attainment (low: 32, medium: 37 and high: 40). The sampling result is not statistically representative for the Dutch population – 109 subjects is a large number for an experimental test, not for a survey – but gives a fairly good indication of the performance level of the Dutch population as much trouble was taken to reach sample dispersion.

3.2 Technical Specifications

The studies were conducted in an office of the University of Twente, where the setting was equally new for all participants. Participants used a keyboard, a mouse and a 17 inch monitor connected to a laptop that provided the three most popular internet browsers (Internet Explorer, Mozilla Firefox and Opera). This allowed participants to replicate their usual internet behavior. No default page was set on the browsers and all new assignments started out with a white page. To ensure that participants were not influenced by previous user's actions, the browser used was totally reset. The laptop was connected to the Internet with a high-speed university network.

3.3 Performance Test Assignments

Nine assignments in the field governmental or political information retrieval strictly following the operational framework described above were prepared. Two tasks were made to measure operational skills, two for formal skills, three for information skills and two for strategic skills. The selection and creation of the assignments accounted for the following rules:

- The assignments consisted of actions that the government assumes citizens are able to perform;
- When tasks pointed to a particular website – and were not chosen by the subjects themselves browsing on the Internet to find answers to questions- sites that score well on usability in a Dutch benchmark for public websites were offered;
- All assignments were pilot-tested with twelve participants to check the understandability, difficulty and applicability of tasks.

Subjects' performances were measured both by successful assignment completion and by the time (in seconds) spent on each assignment. Participants themselves decided when they were finished or wanted to give up on an assignment. After some time a deadline appeared when the test leader gently asked the subjects to pass to the next assignment. Only one answer or action was defined to be correct in advance. If the correct answer was not found, the task was rated as not completed. A full overview of the assignments is available [13].

3.4 Questionnaire

Prior to the experiment, a 10 minute questionnaire was administered to gather some personal data such as age, gender, ethnic background and information about the frequency and location of respondents' regular Internet use, the types of activities they perform online and their social support networks.

4 Results

4.1 Operational Skills

For measuring operational skills, two assignments were administered, consisting of nine tasks altogether. The first assignment tested whether subjects were able to perform some basic operations, including clicking a link, saving a PDF, downloading files, adding a website to the Favorites and performing a search operation. In assignment 2 subjects had to complete a web based form on a public website.

The subjects completed an average of 7.2 (SD=2.0) tasks and needed 553 seconds (SD=254). According to table 1 education, age and experience are the main predictors of the level of operational skill. They are significant both for number of tasks completed and time spent on the tasks.

Table 1. Linear regression results for the number of operational tasks completed and the time spent

	Nr of tasks completed		Time spent on tasks	
	t	Beta	t	Beta
Gender	-0.82	-.06	-1.30	-.08
Education	3.86	.32***	-2.75	-.27***
Age	-3.13	-.30***	5.11	.43***
Internet experience (years)	1.90	.15*	-2.56	-.18**
Weekly time online (hours)	0.55	.04	-1.44	-.10
Internet course (no/yes)	0.45	.03	-0.14	-.01
Support at home (no/yes)	-1.47	-.12	1.83	.13
Location (at home/elsewhere)	1.15	.08	-1.15	-.07
Working condition (inactive/active)	1.62	-.15	-1.97	-.16*
Adjusted R^2	.52		.64	
F	14.02***		22.34***	

*$p < .05$, **$p < .01$, ***$p < .001$.   N=109.

4.2 Formal Skills

For measuring formal skills, two assignments were administered, consisting of four tasks. The first assignment tests whether a subject is able to follow multiple links in a menu, doesn't get disoriented when a new window is opened and can browse and open (more than one) search results. The second assignment tests whether subjects are able to locate similar contact information in different website layouts and designs.

The subjects completed an average of 2.9 (SD=1.0) tasks and needed 616 seconds (SD=255). As presented in Table 2, education and age again are the main predictors for the number of formal tasks completed. Additionally, the amount of time spent online each week appears to be negatively related to the time spent on the formal tasks.

Table 2. Linear regression results for the number of formal tasks completed and the time spent

	Nr of tasks completed		Time spent on tasks	
	t	Beta	t	Beta
Gender	1.06	.08	-2.17	-.15
Education	2.94	.25**	-1.98	-.16*
Age	-2.58	-.26*	5.01	.46***
Internet experience (years)	1.56	.13	-1.68	-.13
Weekly time online (hours)	-0.30	-.02	-1.66	-.13
Internet course (no/yes)	1.00	.07	-0.24	-.02
Support at home (no/yes)	-3.08	-.26**	1.65	.13
Location (at home/elsewhere)	2.40	.18*	-0.76	-.05
Working condition (inactive/active)	1.26	.12	-1.07	-.09
Adjusted R^2	.49		.57	
F	12.39***		16.46***	

*p < .05, **p < .01, ***p < .001.   N=109.

4.3   Information Skills

For measuring information skills, three assignments were administered. In the first assignment subjects had to find information in a closed environment, a municipal website. The other two assignments are open web tasks (no specific homepage or search engine assigned). Subjects completed an average of 1.9 (SD=0.8) assignments and needed 939 seconds (SD=449). Regression results in Table 3 indicate that education is the only significant predictor for the number of information tasks completed.

Table 3. Linear regression results of the number of information tasks completed and the time spent

	Nr of tasks completed		Time spent on tasks	
	t	Beta	t	Beta
Gender	-1.35	-.13	-0.15	-.01
Education	3.12	.36**	-2.06	-.22*
Age	-0.89	-.12	1.84	.23
Internet experience (years)	0.60	.07	0.01	.00
Weekly time online (hours)	-1.02	-.11	0.15	.02
Internet course (no/yes)	0.27	.02	-0.85	.00
Support at home (no/yes)	-0.00	.00	1.82	.19
Location (at home/elsewhere)	1.12	.11	-0.75	-.07
Working condition (inactive/active)	-0.31	-.04	-1.36	-.16
Adjusted R^2	.13		.23	
F	2.82***		4.67***	

*p < .05, **p < .01, ***p < .001.   N=109.

4.4 Strategic Skill Assignments

For measuring strategic skills, two assignments were administered. In the first assignment subjects had to find out what benefits they could gain when being underpaid (the benefit being the retrieval of unpaid salary). The second assignment demanded that subjects indicated their favorite political parties in succession, taking three political positions into account. To accomplish this task, the subjects needed to visit the websites of the three relevant political parties or combine the parties' names with a specific position in a search engine. The subjects completed an average of 0.5 (SD=0.7) tasks and needed 1466 seconds (SD=575). According to Table 4, education is the main predictor for the number of strategic tasks completed. No significant time differences are reported. This might be due to the fact that successful completion is low on strategic tasks.

Table 4. Linear regression results for the number of strategic tasks completed and the time spent

	Nr of tasks completed		Time spent on tasks	
	t	Beta	t	Beta
Gender	-.72	-.06	-1.11	-.11
Education	4.24	.42***	1.06	.13
Age	-1.42	-.17	-0.19	-.03
Internet experience (years)	0.21	.02	0.54	.06
Weekly time online (hours)	-1.60	-.15	-1.23	-.14
Internet course (no/yes)	0.31	.03	0.47	.05
Support at home (no/yes)	-1.61	-.16	1.20	.14
Location (at home/elsewhere)	-0.61	-.05	-0.26	-.03
Working condition (inactive/active)	1.29	.14	-0.62	-.08
Adjusted R^2	.30		.01	
F	6.09***		.84	

*p < .05, **p < .01, ***p < .001. N=109.

5 Conclusions

Answering the first research question, we are tempted to conclude that Dutch citizens have a fairly high level of operational and formal skills. On average 80% of the operational skill assignments and 72% of the formal skill assignments were successfully completed. However, the levels of information skills and strategic Internet skills attained are much lower. Information skill assignments are completed on average by 62% and strategic skill assignments on average by only 25% of those subjected to these performance tests. Unfortunately, there are no standards of comparison since comparable performance tests in other countries are non existent. Anyway, the Dutch government's expectation that every citizen with an Internet connection is able to complete the assignments, clearly is not justified.

Answering research question 2, we can conclude that the level of digital skill performance is quite different among categories of the Dutch population. Educational level attained is the most important correlating factor. All performances, both in number of tasks completed and amount of time spent on tasks with all four types of digital or Internet skills, are significantly different for people with high, medium and low education.

Age is the second most important correlating factor. However, only for operational and formal skills. An interesting conclusion is that the so-called 'digital generation' (18-29), that in this investigation also scores relatively high in operational and formal tasks, does not perform significantly better in information and strategic skills than the older age groups, despite the fact that these groups score lower on operational and formal skills.

A remarkable conclusion of this investigation is that internet experience only correlates with the number of operational tasks completed and time spent on them. Amount of time spent online weekly only correlates with time spent on formal Internet tasks. It appears that information and strategic skills do not grow with years of Internet experience and amount of time spent online weekly.

One of the most important general conclusions of this investigation is that operational and formal Internet skills are a necessary but not sufficient condition for the performance of information skills and strategic skills when using online public services. For future policy, this result should be taken into consideration. For programs aiming on digital skill improvements, it is important to focus on the full range of skills outlined here. Also, recommendations for improving public websites should take into account the four skill levels and their uneven distribution.

6 Discussion

This paper has shown that in the context of the use of online government services, information and strategic Internet skills are the most problematic and unequally divided digital skills among the Dutch population. Most likely, they also are in other countries of the world. This means that surveys that usually only try to measure operational and formal skills, give a flattering picture of the actual digital skills of populations. It appears that observations in actual skills performance tests are more valid than survey questionnaires to measure digital skills.

An important discussion point is whether the information and strategic skill divide has not always been there. These skills might heavily depend on ones intellectual skills, causing a divide between the ones with more intellectual capabilities than others. In our view, this is partly true. We believe that the divide between citizens with better and lower information and strategic skills is widening, since the amount of information available becomes larger for a more width spread audience. This means that it becomes harder to find and use required information. Citizens with a high level of information and strategic skills will be able to use the enormous amount of information for their own particular goals. This makes the Internet an enormous opportunity in a variety of ways. However, for people with lower information and strategic skills it will become harder and harder to use the Internet this way. For them, the challenge will be to be able to find correct information at all.

Besides intellectual skills, it can be discussed whether so called bureaucratic skills play a major role when using online public services. Knowledge of the government will increase as one becomes older. Although, we doubt that these skills have influenced the results – assignments were kept quite simple – future research should account for them. This can be done by measuring these skills directly, or by performing research with the same skill range on different topics. Than, the varies skill divisions can be compared mutually.

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Citizen Participation and Involvement in eGovernment Projects: An Emergent Framework

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Abstract. This paper reports from an action research project where focus groups have been used as an approach for taking citizens' requirements into account during public e-service development projects. In the paper we use theories from the area of user participation in the information systems (IS) discipline in order to discuss and enhance the specific aspects of citizen participation and involvement in the eGovernment context. The main purpose of this paper is to enrich the eGovernment field in general, and to facilitate the citizen perspective in eGovernment development projects in particular, by using notions from the user participation tradition in the IS discipline. Our empirical findings from performing focus groups are discussed and compared to well-known user participation theories from the IS discipline. This results in an emergent framework for better understanding of citizen participation and involvement in the eGovernment context. The emergent framework consists of a set of questions that can be used in order to put an increased focus on the citizen perspective in future eGovernment development projects.

Keywords: eGovernment, IS development, user participation, citizen participation, citizen involvement, focus group.

1 Introduction

This paper explores how focus groups can be used as an approach for taking citizens' requirements into account during public e-service development. This is made in order to develop e-services that are usable, understandable, and accountable and to make sure that there are incentives and benefits present to use the e-services from a citizen perspective. In the paper we use user participation theories from the information systems (IS) discipline in order to discuss the particular aspects of citizen participation and involvement in the eGovernment context. In IS research there has been a long tradition of focusing on user participation during systems development, not at least in Scandinavia [e.g., 5, 15].

   During the short life-time of eGovernment until today (2008), a government perspective has often overshadowed a citizen perspective. eGovernment projects have also focused mainly on technical characteristics [27] and authority productivity, but rather little on citizens' needs [1]. The citizen perspective has often been forgotten or

hidden away in the design and implementation of eGovernment solutions so far [8]. In the same time, there is an increasing body of research claiming that the citizen perspective needs to be strengthened in order to develop successful eGovernment [25] in a holistic sense.

The main purpose of this paper is to enrich the eGovernment field in general, and to facilitate the citizen perspective in eGovernment development projects in particular, by using notions from the user participation tradition in the IS discipline. This is done by analyzing and discussing how focus groups have been used in an action research project, as an approach for strengthening the citizen perspective. In this paper the findings from the performed focus groups are not in focus per se. Instead the findings are put in relation to well-known user participation theories from the IS discipline. The analysis results in an emergent framework for better understanding of citizen participation and involvement in the eGovernment context. The emergent framework consists of a set of questions that can be posed in order to put an increased focus on the citizen perspective in future eGovernment development projects. This is done in order to reach holistic solutions.

The paper has the following disposition; after this introduction previous studies on user participation within the IS discipline are discussed and related to the citizen perspective in eGovernment. In the next section, the action research project and the organization of the focus groups, which serve as our empirical context, are described. Thereafter the focus group experiences are discussed and related to user participation theories in our emergent framework for better understanding of citizen participation and involvement in the eGovernment context. In the concluding section of the paper, we summarize our contribution and formulate some ideas for further research.

2   Viewing the Citizen Perspective through the Lens of User Participation

In this section previous studies on user participation from the IS discipline are discussed and related to the citizen perspective in eGovernment. This is done in order to identify if and how user participation theories can help us to emphasize the citizen perspective in eGovernment.

2.1   User Participation within the IS Discipline

Among Scandinavian IS researchers there has been a strong emphasize on user participation during IS development for several decades [6]. User participation has been seen as a means to increase working life democracy and has in many situations been regarded as the one and only way to develop information systems. As a specific school of user participation within the IS discipline, participatory design (PD) has been put forth [26]. PD has a distinct focus on political effects of systems design and is much oriented towards changes in distribution of workplace power due to introduction of IS [16]. Besides this political focus, PD also emphasizes user participation as such, as well as methods and techniques to support participation (ibid.). In this paper, though, we discuss user participation in the IS discipline without delimiting the discussion to a certain school, as, e.g., PD, cooperative design [13], or user-centered design [22]. We do not deal with the political effects and the distribution of power in this paper.

Although this huge interest in participation in the IS discipline, there have also been many studies questioning the effects of user participation regarding, e.g., system success [18]. Cavaye [7] reports on an extensive review of studies showing both positive and negative relationships between user participation and success.

Mumford [21] is a pioneer in the field of user participation in IS development. She distinguishes between three types of user participation; which imply varying user influence on the outcome; consultative (i.e., user needs influence design decisions made by the design team), representative (i.e., affected user groups are represented in the design team), and consensus (i.e., all users are involved through communication and consultation). Cavaye [7] describes six attributes of user participation which can be used as dimensions with various values in order to characterise user participation. The attributes and possible values are (ibid.); type of participation (all users or representatives), degree of participation (level of responsibility for the participants), content of participation (involvement in different design aspects), extent of participation (variation in scope in different phases of the development process), formality of participation (formal or informal organisation of participation activities), and influence of participation (effect of participation on the development effort). The framework of Cavaye (ibid.) has later been used and further developed by Lynch and Gregor [18] who add the attribute depth of participation. The depth attribute can be indicated by three factors; the stages of the development process where users are involved, the frequency of interactions with users, and whether the users have any voice in the development process (ibid.)

2.2   The Conceptual Difference between User Participation and Involvement

Hartwick and Barki [14] argue that we need to separate between the concepts of user participation and user involvement, in order to increase our possibilities to reach full system success when developing information systems. Thus, they suggest that these concepts must be treated as different issues instead of being used as synonyms. This implies that they define user participation as "the behaviours and activities that users or their representatives perform in the system development process" (ibid. p 441). User involvement is referred to as a psychological state which is defined as "the extent to which a person believes that a system possesses two characteristics, importance and personal relevance" (ibid. p 442).

In their literature review of relationships between user participation and system success, Lynch and Gregor [18] find a strong positive relationship between user involvement (feelings of involvement) and implementation success, but only a moderate relationship between user participation (participative activities) and success. These findings are interesting and potentially beneficial to relate to the eGovernment field. When discussing citizen benefits of public e-services we have argued that citizens should participate in the development process in order for the developers to identify their needs and demands and, thus, develop e-services that suits user needs. On the other hand, citizen participation is much more complex to accomplish to a broad extent compared to user participation in internal IS development projects (which might be difficult enough to reach in many cases). In this paper we report from a project where we have used focus groups as a means to reach citizens, but of course this has only facilitated contact with an extremely small amount of the future, potential users of the web portal.

This makes us believe that the conceptual division between participation and involvement might be extra important within the eGovernment context. There exists a large potential within the area of facilitating citizen participation in eGovernment development projects, by, e.g., organizing focus groups, cooperating with citizen organizations, and using citizen questionnaires. At the same time, we have a responsibility to increase citizen involvement in these development processes and especially in the outcome of these processes. The citizen involvement regarding a specific eGovernment solution could, according to Hartwick's and Barki's [14] argumentation, be related to two attributes; the citizen's notion of importance and personal relevance. Another way to express this is to say that citizen involvement in eGovernment is tightly coupled with the citizen attitude towards, e.g., a specific public e-service. Does the citizen feel that the e-service covers an important issue and is it relevant for him or her to use this e-service? If we can find approaches and/or methods to prioritize and develop public e-services that meet these two demands, we would probably have good possibilities to increase the citizen involvement in eGovernment.

2.3   The Citizen Perspective within eGovernment

As mentioned in the introduction above, a majority of eGovernment studies have so far taken a government perspective. Fewer studies discuss eGovernment from a citizen perspective, or from both perspectives. At the same time, there are researchers highlighting the importance of widening the research scope in order to comprise problems that belong to the citizen perspective as well [e.g., 1, 25]. It is also important to understand that even if there are studies discussing user participation in an eGovernment context, user participation does not necessary imply that citizens are acting in the project. Følstad et al. [10], e.g., refer to agency employees when discussing user participation. Oostveen and van den Besselaar [23] report on a study where participation took place by letting social researchers function as an intermediary between citizens and designers, i.e., by performing telephone interviews.

There is, however, some recent research focusing on the need for public administrations to understand the needs and interests of the ones who are supposed to be helped by the agency (i.e., the citizens) [25]. This is especially valid for agencies which adopt some kind of eGovernment solution. In such cases, the eGovernment development project teams need to consider the users of the resulting system in the same way as in any IS development, according to the discussion above. This line of research often uses the metaphor of customer orientation [ibid.; 17] to explain the need for increasing the citizen perspective, in line with a New Public Management paradigm. Goldkuhl [11] asks, e.g., what it means to serve a citizen through an e-service and highlights a lack of client orientation when designing public e-services.

Apart from the studies mentioned above, so far there seem to be rather few studies that take their point of departure from the citizen perspective when discussing eGovernment. Reddick [24] distinguishes between studies from the supplier side (the agency) and studies from the demand side (the citizens). He concludes that there are very few studies to find which emphasize eGovernment issues from the demand side perspective (ibid.).

As a result from this review of user participation literature within the IS discipline and the identified lack of a citizen perspective in many eGovernment studies, we

argue that the citizen perspective needs to be strengthened in order to reach holistic solutions and processes. One way of handling this "gap" is by transferring notions from user participation theories to the still emerging eGovernment field. Anthopoulos et al. [1] state that if an eGovernment solution should be considered as a success, the most important thing is that citizens are served and satisfied. Otherwise they will return to other, traditional channels for their government interaction, and the expected benefits for agencies will not be met. This can be related to the idea formulated above, that citizen involvement in eGovernment is depending on the citizens' attitude towards the IT based interaction between government and citizen. Fischer [9], who has focused much on citizen participation outside the field of eGovernment, states that citizen participation is complicated and needs to be carefully planned in advance in order to be successful. We need, thus, to develop further understanding of how we can provide opportunities for citizens to both actively participate and be involved in eGovernment development work.

3   The eGovernment Development Project

The research project that we refer to in this paper concerns inter-organizational e-service development in the public sector in Sweden. The aim of the project was to develop (1) a web portal where e-services and information concerning the driving license process should be easily accessible for citizens, and (2) one-stop government e-services for driving license matters. In this paper the development initiative of the web portal is focused (c.f., www.korkortsportalen.se). The main motive for the portal development was that responsibility for driving license issues in Sweden is divided between several government agencies. It is, thus, difficult for citizens to find information and get in contact with the correct agency when having driving license errands. In order to solve these problems, a web portal was developed. The portal covers several important aspects within the driving license area; it provides citizens with right information and access to e-services, and it serves as a bridge between the involved responsible government agencies and organizations. The portal is, thus, a so called real one-stop eGovernment solution [12].

As in many eGovernment initiatives, the purpose of this project was originally formulated as a dual goal of increasing citizen benefits and increasing agency internal efficiency (e.g., concerning driving license errands in the internal processes of the agencies). An important aim was that the results from the project should have a distinct service focus of an inter-organizational nature, in order to decrease the unclear responsibility division between authorities that citizens might experience and suffer from. One important research aim of the project was to develop a method for development of inter-organizational e-services in the public sector and contribute to the theoretical knowledge on e-service development. The results reported here are important parts of this contribution.

3.1   Action Research

The research project was, as mentioned above, an action research (AR) project with the purpose of both developing and evaluating e-services. AR is a qualitative research approach that is often used within the IS discipline [4]. To solve practical problems,

issues and concerns and at the same time develop scientific knowledge is the core of AR, also characterizing the present project. Another important characteristic in AR is the intention to develop a comprehensive view of the social systems that are studied. Social systems are usually in transition or change when studied and intervened. The intervention means that researchers observe and participate in the studied phenomena [3]. Several issues and challenges in practicing AR in an eGovernment context are reported in literature [19]. The empirical findings presented in this paper have been generated during our participation in the present development project. The findings have then been theoretically grounded and analyzed.

Three Swedish agencies were involved in the project besides the researchers; Sweden's County Administrations (SCoA), which organizes the 21 county administrative boards of Sweden, the County Administrative Board of Stockholm and the Swedish Road Administration (SRoA). The portal development project was hosted and led by SRoA, but all organizations were represented in the project. The e-services and the web portal development initiatives were established prior to the AR project. The e-service development project initially started without any explicit strategy for user participation. The citizen perspective, and the potential of citizen involvement, seemed to be more or less forgotten in the planned project activities. Instead, the development of the e-services for driving license matters and the web portal started in a group of internal representatives from the SCoA and SRoA together with external IS development consultants. The outcome from the development project was not at first anchored in any citizen requirements or explicitly expressed problem outside the government agencies. The driving license issues were chosen as targets for the public e-service project because these issues were supposed to be rather uncomplicated to develop e-services for. The development group was mainly focused on how the e-services would influence the internal procedures and routines at the agencies. The external consultants were left with rather free choices regarding how the e-services should be developed and designed. User requirements were mostly "guessed" (supposed) by the agency officers according to their prior experiences from direct citizen contacts.

When the research project started to follow the development project, the researchers posed questions about the citizen perspective, citizen involvement, and how the user requirements were supposed to be generated during the e-service development process. As a way of handling the situation, and in order to facilitate citizen participation in the development process, we proposed that focus groups should be arranged in order to discuss how young people think about the planned web portal and the e-services. Information gathered from these discussions was meant to complement the information and experiences from the agency officers in the project, in order to consider if their assumptions about the citizens requirements were valid or not.

3.2   Organizing Focus Groups

Focus groups were used in the research project as an approach to gather citizens' opinions, attitudes, apprehensions, and needs regarding the web-based driving license portal during the development process. Two focus groups were arranged by the project group, where the participants either had a driving license or were potential drivers (i.e., persons without a license today who thought they were going to take a driving license in the future). When we gathered participants to our two focus groups, age

was the main factor of selection. We decided to have one group of university students (who were more likely to have a driving license) and one group of high school students. Main reasons for gathering young persons were that they represent an important target group of the web portal and that they possibly would have their own driving license process in close memory or in near future.

The two focus groups were gathered so that they consisted of seven respectively five participants. Each group was led by two moderators. The main assignment was to discuss early (low-fidelity) prototypes of the web portal regarding information, e-services, and user interface. One of the groups consisted of seven university students (table 1). The assumed outcome from this group was thoughts about information structure and presentation of information. Public e-services were discussed in general and the e-service for application of provisional driving license in particular. Six of the seven students had a driving license, which was a conscious choice since Morgan [20] argues that the participants' background should be as homogenous as possible, when organizing focus groups. The gender diversity as well as the educational diversity were, however, deliberate since the low amount of focus groups demanded a wider range of different experiences and viewpoints within each group. Unfortunately, all individuals in the second focus group had the same educational background, which means that we did not reach the diversity we aimed for in this aspect.

The second focus group (table 1) consisted of high school students (in their second year) who were also pupils at a driving school. The reason for choosing pupils from a driving school was that we wanted to find participants who were likely to take a driving license in the future. Two of the participants in this group had already got their driving license when the focus group meeting was performed. The purpose of this group was mainly to discuss issues regarding the phases before and during the driver education. The main reason for the distorted gender division (eight men and four women) was, unfortunately, accessibility. It would have been preferable to reach equality regarding gender, educational background and driving license possession, but we could not accomplish this because it was difficult to find volunteers to engage in these groups. For further discussions about pros and cons of focus groups, cf. Axelsson and Melin [2].

Table 1. Focus group participants

Focus group no.	Gender	Age	Education	Driving license
1	Man	32	Information systems	Yes
1	Man	27	Information systems	Yes
1	Man	26	Machine engineering	Yes
1	Man	25	Political science	Yes
1	Woman	26	Economics/business administration	Yes
1	Woman	26	Economics/business administration.	Yes
1	Woman	24	Information systems	No
2	Man	18	Natural science	Yes
2	Man	18	Natural science	Yes
2	Man	18	Natural science	No
2	Man	18	Natural science	No
2	Woman	18	Natural science	No

3.3 Performing Focus Group

Below we present five phases that constitute our focus group performance; (1) introduction, (2) brainstorming, (3) discussion from two user scenarios and a prioritisation of the importance of discussed information and e-services, (4) concept based discussion, and (5) prototype evaluation. The focus groups were initiated by the moderators who introduced the e-service development project aims, gave an overview of the driving license field in general, and the purpose of the focus group. The moderators also described the steps in the process of taking a driving license, in order for everybody to better understand how a web portal might be used in these cases.

After this introduction to the focus group, a brainstorming activity was performed, where the concepts of driving license and electronic identification (which is a necessity for citizen identification in order to use the e-services) were in focus. In the third phase of the focus group, the participants were asked questions in order to discuss information and e-services on the future portal, regarding, for example, search alternatives and service content. Two main scenarios were used in this discussion; (1) a citizen who already has a driving license and (2) a citizen who is in the actual process of getting a license. The results from this discussion were then prioritised by the participants regarding the importance of the proposed information content or e-service. This part of the data generation was made by asking the participants to answer a questionnaire where the importance of proposed information content and e-services should be ranged. Examples of mentioned information content and e-services are; approval terms for the provisional driving license (a permission that everyone who wish to take a driving license in Sweden has to apply for), the driving license process step by step, and rules for private driving supervisors (e.g., parents). The fourth phase of the focus group implied a discussion of how ten driving license concepts were understood by the participants. Discussed concepts were those which the moderators thought could possibly be misunderstood by citizens using the portal because of their complex nature. Examples of discussed concepts are; provisional driving license, knowledge test, driving test, and risk education. The result showed that most of the discussed concepts were hard to understand and the definitions proposed by the participants were more or less incorrect.

The focus group were concluded by an evaluation of a low-fidelity prototype that had been developed in the project. The participants were asked to focus on information content, information presentation, structure, search alternatives, and navigation logic. The discussions resulted in many comments on the proposed structure and layout. The participants found parts of the content to be irrelevant and missed other information. They had comments on chosen icons and names on bottoms as well as on what actions that were possible to perform on the portal. An important suggestion to improve the use of the portal was to add a personalized e-service called "My driving license" (c.f., the "My Pages" concept), where the citizen could login and follow all information regarding his or her driving license process.

As described above the focus groups consisted of five phases. All together these phases generated a sufficient set of information that was considered as essential for the future direction of the e-service development project. Some findings showed that the e-service development project group had made appropriate assumptions regarding the citizen requirements, while other findings from the focus groups came as a surprise to the project team. A common aspect of these more unexpected findings were that they represented the attitudes of young persons. An eighteen years old person

who has lived his or her entire teenager life as a frequent user of Internet, chatting with friends on MSN, using the mobile telephone not only for talking but also to take photos, send SMS, and listen to music, and so on, have certain expectations regarding a government agency's web portal. Their high experiences in these kinds of communication media enable them to take some issues for granted and requesting and prioritising other functions than a more inexperienced user might do. Some participants did, for example, mention that they are used to do everything on Internet and that they become irritated when some things are impossible to handle through this medium. All participants also had very high expectations about what this kind of web portal would contain, even when the moderators were asking about a minimum level.

In the end of the development project, we performed further focus groups in order to evaluate the first version of the launched web portal. These focus groups are not explicitly reported on in this paper, though.

Table 2. An emergent framework for citizen participation and involvement in eGovernment

User participation attributes	Citizen perspective questions	Experiences from the eGovernment development project
Type of participation	Which citizens do participate in development activities? How is citizen involvement reached?	Citizens who belong to the main target group of the e-service under development were chosen as participants. Full citizen participation can never be reach in the case of public e-services. Thus, the collective of citizens was represented by smaller groups of citizens. The type of participation can, in Mumford's [21] terms, be characterized as *consultative participation*.
Degree of participation	What are the citizens' responsibilities?	Focus groups have been used as advisory capacity. The citizens' responsibility has been to participate in discussion and share their opinions regarding discussed issues.
Content of participation	What activities are citizens participating in?	Citizens were asked to discuss different user scenarios, prioritize the importance of different e-services, discuss complex concepts within the field and evaluate a low-fidelity prototype of a web portal.
Extent of participation	In what stages of development do citizens participate? To what extent are citizens involved before, during and after the development process?	Citizens participated in the focus groups during the development project. The focus group results were used as input in the latter phases of the development project. A first prototype was developed prior to the focus groups. Further focus groups were also performed in the evaluation of the first launched version of the web portal.
Formality of participation	How is the citizen participation organized?	Citizen participation was organized in focus groups with an explicit purpose. The group meetings were planned and organized following a certain process; it started with an introduction, was guided by questions and scenarios, and ended with an evaluation.
Influence of participation	What influence do the participating citizens have on the outcome?	The focus group meetings were seen as a way to better understand the future users' needs and requirements. The focus group discussions were documented in a report which served as an important basis for later phases of the development project.
Depth of participation	How active are citizens when participating? How deeply involved are citizens in the development project?	Focus groups were performed both early in the project and during the evaluation phase. The frequency of interaction was low since each focus group only lasted for 2-3 hours and each citizen only participated in one focus group. The voices of the citizens were listened to, though, since the focus groups results were regarded as important input to the development project.
Result of participation	What did the citizen participation result in?	Complex concepts were explained at the web portal as a direct result from the focus group discussions.

4 An Emergent Framework for Participation and Involvement

The empirical findings from using focus groups will now be compared to user participation theories, since collecting citizens' opinions and needs in focus groups might be seen as a special case of user participation in IS development projects. Such citizen participation can also, according to the theoretical discussion earlier in this paper, lead to increased citizen involvement in eGovernment issues. The result of the comparison between our empirical findings and previous studies is an emergent framework for citizen participation and involvement in eGovernment, based on Cavaye [7] and Lynch and Gregor [18]. The first of Cavaye's [7] attributes comprises Mumford's [21] types of user participation.

Below, in table 2, we apply these attributes together with the depth attribute, added by Lynch and Gregor [18], to our experiences of using focus groups in public e-service development. We do also add an attribute about the result of participation, since we miss an aspect about the practical results of user participation among Cavaye's attributes. In order to highlight the implication of the applied attributes in the domain of public e-service development, we have formulated questions regarding each attribute. The questions can, thus, be used in order to put an increased focus on the citizen perspective in future eGovernment development projects.

5 Conclusions

In this paper we have, based on a literature study and an identified need (a "gap") in studied eGovernment development initiatives, acknowledged a need to facilitate citizen participation and involvement in eGovernment development projects. We also claim that the eGovernment field in general would benefit from such initiatives. The emergent framework focuses user participation attributes and suggests beneficial citizen perspective questions in order to facilitate citizen participation and involvement in eGovernment development projects. As mentioned above, these dimensions of the framework are anchored both in literature and empirical studies. In the emergent framework we have exemplified our findings with experiences from the studied eGovernment development project. In this paper we have also argued that the conceptual division between participation and involvement [14] might be extra important to make within the eGovernment context, in order to develop and implement holistic and in some ways successful eGovernment applications.

Further research is needed in order to anchor the different phases used when performing focus groups in the human computer interaction (HCI) literature as well as in modern design theory and in the PD domain (e.g., the political effects of public e-service development and the distribution of power within government(s) and between the government and the citizen). The framework for citizen participation and involvement in eGovernment is an emergent one. Further studies and examination of the framework is needed and planned.

Acknowledgments

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Channel Perceptions and Usage: Beyond Media Richness Factors

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Abstract. In this paper, we asses how service channel perceptions affect channel choice and channel usage. Building on communication theories, such as the Media Richness Theory, we explore how different channel characteristics are perceived by citizens in a Dutch governmental service chain. The results of our study show that channel perceptions are variable along with channel usage (experience) and personal characteristics. This proves that the straightforward task-channel fit as suggested in some multi-channel management models is too simplistic. Besides the fact that theoretically some channels are better suited for particular types of services, multi-channel models should pay attention to the variances in channel perceptions. These insights are highly relevant for the design of the multi-channel and marketing strategies in order to seduce citizens to use the preferred service channels.

Keywords: channel choice, multi-channeling, e-Government, e-services.

1 Introduction

After the Internet hype in the early 2000's, it became clear that the Internet as a service channel was not going to replace other service channels [1]. Hence, both practitioners and theorists have been building new theories and models that do not rely on a single channel, but incorporate multiple channels [e.g. 2, 3]. These theories aim to exploit channel characteristics in order to improve both the quality of service delivery and its cost effectiveness. In marketing, most of these multi-channel management models focus on the relationship between the characteristics of a certain good or service and the channel characteristics. The basic idea is that there is a contingency between certain goods and channels which allows a match based on these characteristics. Berman [4], for example, has suggested that different types of goods require different sales channels. He shows that perishable goods require short channels (short in terms of time and effort) whereas non-perishable goods require long channels. He also indicates that high value goods should be sold via direct channels, whereas low-value goods are to be sold via the indirect channels.

The Media Richness Theory (MRT) [5] also posits that media or channels have a number of characteristics. Based on these characteristics a medium is either 'richer' or 'leaner'. The degree of richness of the channel determines its appropriateness for ambiguous or uncertain tasks. Critics of MRT, and this critique also applies to similar marketing theories, argue that while in MRT the channel characteristics are fixed, in reality, he concept 'media richness' only exists as a perception [6]. Channel Expansion Theory (CET) [7] corrects this theoretical anomaly and argues that when experience with a channel increases, its perceived richness increases as well. Only a few studies have tested this proposition, but all found general support of the effect of experience on channel perceptions and perceived richness [7, 8]. Another point of critique on theories such as MRT is that it remains unclear which characteristics define the 'richness' of a channel [9]. Our study adds to this discussion by (a) combining multiple channel characteristics from different theoretical perspectives and (b) determining how these characteristics are perceived by different customer groups. We empirically test these channel characteristics in the context of public service delivery. We investigate how users of the three main service channels - i.e., front-desk, telephone and website - perceive the different channel characteristics. We also show how these differences relate to personal characteristics and how these differences affect citizens' channel choices. Based on the results, conclusions are drawn regarding the implications of the findings for multichannel management and marketing strategies for the public sector.

2 Theoretical Background

Most important and well-known theory that describes differences between different media or channels is Media Richness Theory (MRT). The main difference, according to MRT, between communication media is that they vary in the capacity to process rich information [5]. The reason for these differences is that media vary in their capacity for immediate feedback, the number of cues and channels used, personalization, and language variety [10]. Immediate feedback means that one is able to respond immediately to a message, making it possible to check the messages' interpretation. The number of cues means there are different ways in delivering the message, via sound, video, but also via non-verbal communication or intonation. The degree of personalization applies to the possibility to adjust messages to the receiver, to increase understanding. Language variety, finally, applies to the possibility to change choice of words and language for the receiver.

Media vary in richness according to the differences on these four characteristics. Rich channels score high on the four characteristics, whereas lean channels lack those characteristics. Daft & Lengel [5] ranked the following (at that time most common) media in order of decreasing richness, face-to-face is the richest medium, followed by the telephone, personal documents, impersonal written documents and finally numeric documents. In 1990, electronic mail was retroactively fitted into the richness ranking and should be positioned just below the telephone, but higher than letters and notes [11]. Jackson & Purcell [12] discussed the richness of the World Wide Web, arguing that it is difficult to asses its richness because "Hypertext on the Web is too malleable

to be anchored at any one place on any of these - immediacy of feedback, number of cues, personalization, and language variety - dimensions" (p. 225).

Many studies on MRT have found mixed research findings [13, 14], this questions the validity of the theory and it's underlying theoretical notions. As mentioned above, two important points of critiques exist, these are the composition of the richness construct (or the channel characteristics) and the idea the MRT assumes that channel characteristics are fixed properties. In the next sections, these points of critique shall be discussed in more detail.

2.1   Channel Characteristics

Regarding the richness construct, it can be argued that more characteristics exist that determine the appropriateness of a channel for certain communication or service related purposes. El-Shinnawy & Markus [9] suggest three factors: functionality, usability and ease of use. In marketing research many studies have been conducted that study how channel characteristics relate to different types of services. Many of those characteristics bear similarity to those described in the theories above, such as the level of 'interactivity' [15], the personal focus or opportunity to clarify personal situations [16]. Marketing research suggest factors such as 'costs' [17], proximity or contact speed [18], and the level of service [19, 20]. Finally, a large stream of research has associated perceived ease of use and perceived usefulness, factors from the Technology Acceptance Model [21], with channel characteristics [22-24].

2.2   Channel Perceptions

Besides the issue which channel characteristics are relevant for communication and/or customer service purposes, the other point of critique on MRT is its rigidness towards those characteristics. The assumption of the MRT that channel characteristics are fixed is questionable. Lee [25] found that the richness of e-mail is not a fixed property. More likely medium richness is like a perception, depending on the interaction between the medium and the organizational context. Similarly, the Social Influence Model argues that media richness exists as a perception that is different for everyone and is influenced by others [6]. Channel Expansion Theory, finally, also argues that richness is a perception. It argues that the perceived richness
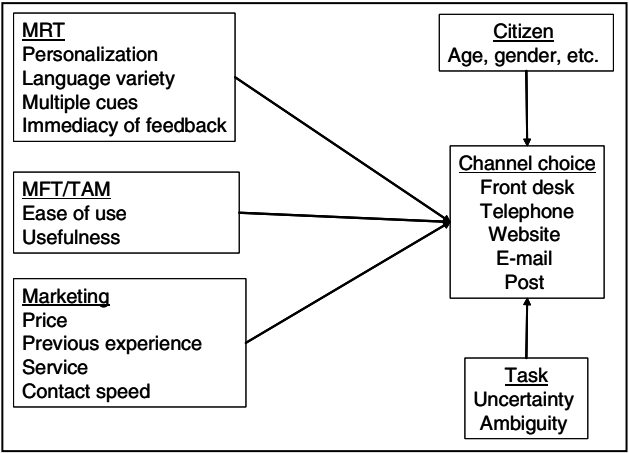

Fig. 1. Proposed research model

varies according to the experiences someone has with the use of the channel. CET also adds the previous experiences as a characteristic of service channels. Basically as CET argues medium richness is not static but dependent on the context and the user. As such we combine MRT with the media feature theoretical perspective and insights from marketing to determine empirically to what extent CET holds in a government setting. The proposed research model therefore looks as shown in figure 1.

Since no extensive research exists that investigates the perceived characteristics of the available service channels and relates these perceptions to channel choice and channel usage, we decided to explore these channel perceptions in more detail. The basic question asked in this paper is, how do citizens perceive the different service channels and do these perceptions affect their channel choices? This main question is further operationalized in four research questions:

1. What channels do the citizens use in their contact with governmental agencies?
2. How do citizens perceive the different channels in terms of their richness and other characteristics?
3. To what extent do those channel perceptions vary along the personal characteristics of the citizens?
4. Do the channel perceptions affect the channel choice and usage of the citizens?

3   Method

To answer the research questions described above, we conducted a survey among Dutch citizens. The survey took place in a large Dutch municipality (155.000 inhabitants). In this municipality various governmental agencies collaborate in providing citizens one-stop government service around social security issues. Citizens can contact government in this region via the front desk, telephone and website. We decided to survey the citizens via these three main channels. This method ensured that we could question citizens that had made an actual channel choice to contact government. As a result we directly link channel perceptions to channel choice. In terms of size, population and services, the municipality can be characterized as an average Dutch municipality.

We mostly used existing measures of (perceived) channel characteristics. Each perception was measured using one question. Regarding these characteristics, the respondents were asked to indicate which channel suited the characteristic best. Table 1 gives an overview of the channel characteristics and the corresponding survey questions.

Besides the channel characteristics, we asked respondents which channel they use most often for their contacts with governmental agencies and which channel they prefer for their government contacts. We also asked citizens which channels they had used during the past 12 months. For channel choice we used the actual channel via which the citizen had filled in the questionnaire as a measure and we asked the citizens why they had chosen that channel.

During the weeks 48-51 of 2007 and 1-4 of 2008, we surveyed citizens that contacted government via the three channels. Citizens who visited the front desk were asked to fill in the questionnaire behind a computer. Visitors of the website were redirected to the electronic questionnaire. Citizens that contacted government via the phone were surveyed via the phone. A total number of 233 respondents filled in our survey; 100 citizens via the front desk, 100 via the telephone and 33 via the website.

The number of respondents via the website is lower than anticipated. Nevertheless, the number of respondents is sufficient for statistical analysis. The characteristics of the respondents were compared to those of the population and the sample reflected the characteristics of the population sufficiently, so the data were not weighted.

Table 1. Operationalization of channel characteristics

Concept	Operationalization
Price	This channel is for me the cheapest.
Ease of use	This channel is the easiest to use.
Usefulness	This channel is the most useful.
Experiences	With channel I have the best experiences.
Service	This channel provides me the best service.
Contact speed	Via this channel I am in contact with the government the quickest.
Immediacy of feedback	This channel provides immediate feedback.
Multiple cues	This channel allows information to be transmitted in multiple ways.
Language variety	This channel enables to use varied language
Personalization	This channel allows me to tailor messages to my own circumstances

4   Results

Figure 2 shows that the customers tend to use and prefer the front desk and the telephone. Actually given the indicated preferences usage of the front desk would be even higher. In terms of the digital channels, i.e., the website and e-mail, our results show slightly higher preference than usage. Overall the traditional channels are still favored. To determine if certain groups of customers favor a channel compared to other groups, we analyzed channel usage based on social demographics such as age and gender. Based on results from previous research it is to be expected that younger and higher educated citizens tend to use the digital channels, i.e. website and email. Nevertheless, our results show that this is not the case. The explanation for this result may lie in the relatively low level of education for the young respondents. The results show that channel usage only varies significantly based on age. Respondent characteristics such as gender and education do not seem to affect channel usage. Moreover, we see a very strong correlation between the channel used last and the channel used most often. This strong correlation applies most to
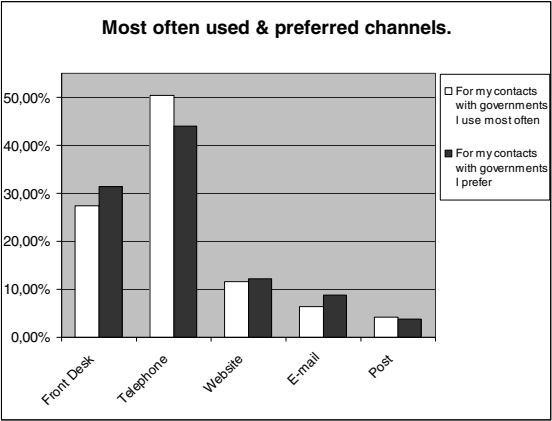
Fig. 2. Most often used and preferred channels

Table 2. Channel usage, personal characteristics and channels used last (channel choice)

	CHANNEL USED MOST OFTEN				
	Front desk	Telephone	Website	E-mail	Post
Demographic characteristics (age, gender, education)					
15-25	72.7	18.2	0	9.1	0
25-45	29.7	46.2	16.5	6.6	1.1
45-65	23.7	45.8	11.9	6.8	11.9
> 65	0	100.0	0	0	0
Male	32.4	36.8	13.2	11.8	5.9
Female	27.2	52.4	12.6	3.9	3.9
Low	29.2	52.8	9.7	4.2	4.2
Medium	37.3	40.7	10.2	8.5	3.4
High	15.0	42.5	25.0	10.0	7.5
Channel used last					
Front Desk	43.6	36.2	8.5	7.4	4.3
Telephone	16.9	73.0	1.1	3.4	5.6
Website	9.1	30.3	48.5	12.1	0
TOTAL	27.3	50.5	11.6	6.5	4.2

Age: χ^2 (12, N = 167) = 28,238, p = .005, Gender: χ^2 (4, N = 171) = 6,536, p = .163
Education: χ^2 (8, N = 171) = 12,959, p = .113, Response method: χ^2 (8, N = 216) = 85,087, p < .000

customers who last used the phone and who indicate they use the phone most often. Similar results were found when determining the relationship with preferred channel (instead of channel used most often).

4.1 Channel Perceptions

Figure 3 shows an overview of the channel perceptions for each of the channels. The results show very different perceptions for the various channels. For instance the front desk seems to score highly on factors such as service, previous experience, multiple cues and personalisation. For the telephone contact of speed, immediacy of
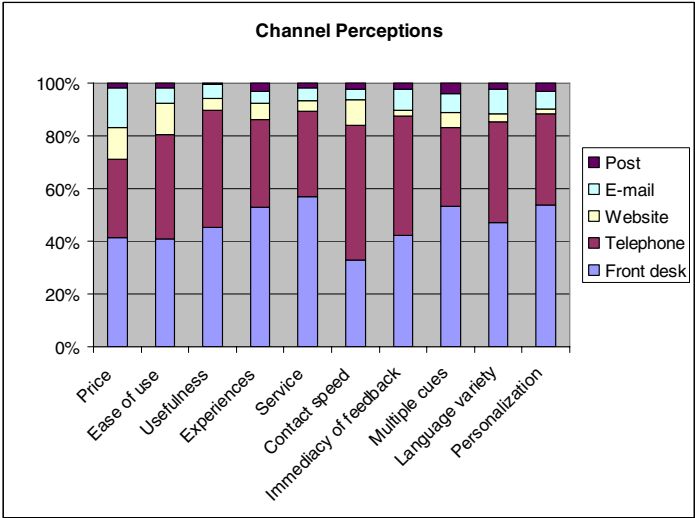
Fig. 3. Channel perceptions of the different channels

feedback and usefulness seem to have the upper hand in case of the electronic channels (website and email) price and ease of use are mentioned most often.

Further, we conducted a Homogeneity Analysis (HOMALS) to analyze whether the various channel characteristics are perceived as a homogenous set of characteristics or not. HOMALS is comparable to a factor analysis, but is suited for categorical data. Our analysis shows there are two factors or dimensions in the channel characteristics. Figure 4 shows a graphical representation of the different characteristics plotted on the dimension. Interestingly, the MRT factors are mostly in the lower half of the figure, whereas the TAM, CET and MARKETING

Fig. 4. Two dimensional plot of channel characteristics

factors can be found in the upper half. This is an indication that the characteristics that are theoretically different, also show empirical differences.

Next step in the HOMALS is to plot the different channels in the two dimensional space. This is shown in figure 5. This is an indication of how the different channels are related to the different channel characteristics. As the figure shows, the different channels all occupy their own distinctive area in the space. Front desk and

Fig. 5. Two dimensional plot of channels

telephone are mostly associated with the MRT factors, whereas website and e-mail are strongly related to TAM/CET factors.

Next, we analyzed how the different demographic characteristics affect channel perceptions. We find significant differences on channel perceptions for the various channels given the customers' demographics and the channel last used. For instance, we find that women perceive the telephone to have strong ease of use whereas men tend to perceive the front desk and web site strong on this characteristic. In terms of a classic MRT factor we find differences for the perception of multiple cues. More specifically lower educated citizens associate the front desk with multiple cues whereas higher educated citizens associate the telephone and website with multiple cues. 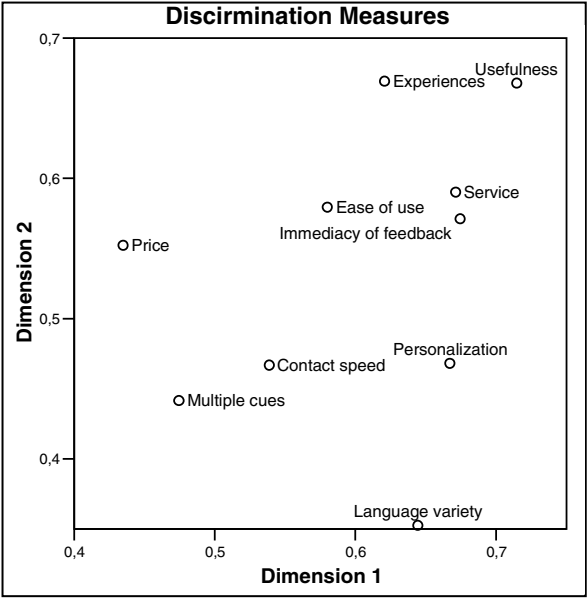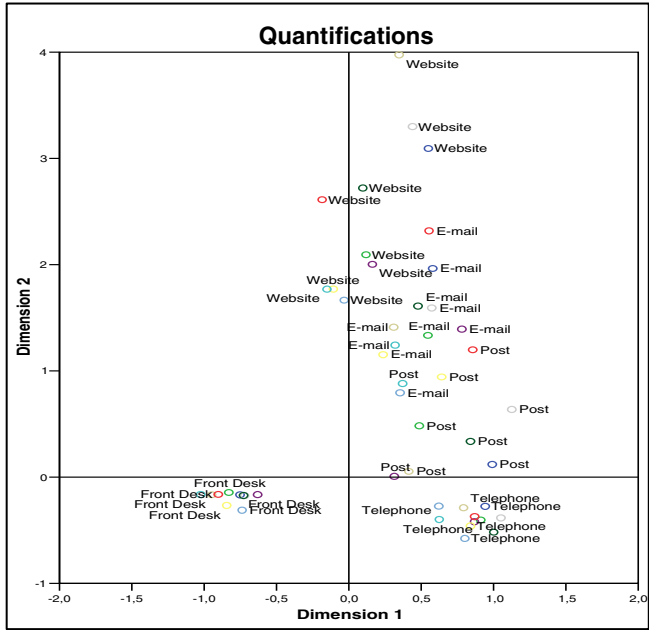These differences are a first indication that indeed the assumption of the MRT – i.e. that the characteristics of media are fixed – can be falsified. Most interesting finding here is that channel choice, in terms of the channel used last strongly affects channel perceptions, we found significant differences on each of the channel characteristics (see the appendix of an overview of the test results). This means that users of the front desk associate all channel characteristics most strongly with the front desk, people phoning government associate all characteristics with the telephone and citizens who visited the website associate all characteristics with the website. This may be a strong indication for the channel expansion effect; (perceived) richness increases as experience with channel usage increases. Moreover this result is another indication of the notions that channel perceptions are strongly variable alongside the personal circumstances of the citizen. Finally, we analyzed, using chi-squares, how channel perceptions vary along the channels citizens use most often and the channel they prefer. The channel used last (front desk, telephone and website), was used as a layer. This allows us to assess whether channel choice and channel usage are related and are influences through the channel perceptions. The table below shows the p-values of the chi-square tests.

A number of findings are remarkably interesting. First of all, the results show that citizens do not only relate channel perceptions to the most often used and preferred channel, but these differences are also reflected in their channel choices. To give an

Table 3. Channel choice, use and perceived channel characteristics

CHANNEL CHOICE, USE & PERCEPTIONS					
CHANNEL USED MOST OFTEN			PREFERRED CHANNEL		
Front desk	Telephone	Website	Front Desk	Telephone	Website
Price	0.000	0.516	0.065	0.000	0.022	0.037
Ease of use	0.000	0.298	0.000	0.000	0.003	0.000
Usefulness	0.003	0.052	0.056	0.000	0.004	0.024
Experiences	0.000	0.018	0.001	0.000	0.448	0.005
Service	0.000	0.020	0.225	0.000	0.226	0.185
Contact speed	0.000	0.000	0.000	0.000	0.002	0.000
Immediacy of feedback	0.000	0.018	0.094	0.000	0.042	0.009
Multiple cues	0.000	0.004	0.741	0.000	0.022	0.294
Language variety	0.000	0.000	0.636	0.000	0.000	0.208
Personalization	0.001	1.03	0.051	0.000	0.004	0.007

example, that also helps in the interpretation of the table; regarding contact speed, citizens that chose the front desk as their last channel see the front desk not only as the channel offering the best contact speed, it is also their most often used channel. Website visitors also see the website as having the best contact speed and they regard the website as their most used channel. Second, the relationship between channel choice, usage and perceptions is stronger for front-desk visitors than for citizens seeking telephonic contact and especially website visitors. This may mean a couple of things, first of all, front desk (and telephone) are the most used channels, through the extensive usage of these channels citizens using these channels may have more favorable perceptions towards these channels. Another interpretation is that website visitors, who generally use more channels, have a more balanced perception of the channel characteristics; they may associate some characteristics with one channel and other characteristics with another. Finally, it is possible that the number of respondents via the website was to low for many of the effects to become significant.

5   Conclusions

The first research question formulated was; "what channels do the citizens use in their contact with governmental agencies?", we found, in accordance with previous studies [26, 27] that citizens still rely strongly on the traditional service channels. The telephone is the most used channel, it also is the preferred channel. The electronic channels are used to a lesser extend, but more citizens indicate their preference for this channel, this is an important indication for the potential growth of the use of this channel in the future.

The second research question regarded the perceptions of the channel characteristics. In general, most characteristics are associated with the traditional service channels, however, the variance in perceptions is large. The front desk scores highly on factors such as service, previous experience, multiple cues and personalisation. For the telephone contact of speed, immediacy of feedback and usefulness seem to have the upper hand. The electronic channels are associated with price and ease of use. The homogeneity analysis showed that there are different dimensions in the channel characteristics and these dimensions relate to the different channels. The traditional channels score higher on the MRT factors, whereas the electronic channels score higher on the TAM factors.

To what extent do those channel perceptions vary along the personal characteristics of the citizens? It is difficult to answer this third research question, the channel perceptions vary strongly along the personal characteristics, but there is no onedimensional relationship. Whereas channel choice and usage have been linked extensively to personal characteristics, finding mostly strong relationships on variables such as age and education, we cannot draw straightforward conclusions regarding the sociodemographic characteristics. However, from the three characteristics, education seems to cause most differences. Mostly in the direction of the higher educated having favourable perceptions of the electronic channels.

The final research question regarded the channel perceptions and their relation with channel choice and usage. Our results made clear that there is a strong relationship between the channel chosen last and the channel perceptions, as well as between most

used and preferred channel and channel perceptions. People tend to choose the channels whose characteristics they perceived most positive. However, this relationship between channel choice, usage and perceptions is stronger for front-desk visitors than for citizens seeking telephonic contact and especially website visitors. Our study is the first to assess the perceptions of multiple characteristics of service channels by (different groups of) citizens. As our study makes clear; channel characteristics are far from fixed, as suggested by various theories and multi-channel management models. Channel characteristics are perceptions and those perceptions determine whether citizens will choose this channel or not. So, it may be very well possible that citizens perceive a channel to posses a characteristic, whereas the channel wouldn't have this attribute according to more objective criteria. Moreover, channel perceptions vary strongly with the personal characteristics of the citizens, as well as actual channel choice, channel usage and channel preferences. Both practitioners in the field of service channels, as well as multi-channel management theorists should take into account these differences when building or enhancing their strategies, models or theories.

Future research should aim at connecting the perceptions of channel characteristics with for example (perceived) task or service characteristics. Through statistical modelling techniques, such as structural equation modelling a deeper understanding can be developed of the relationships between channels, services and the citizens using those channels to obtain services.

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Appendix

	CHANNEL PERCEPTIONS
	Age
Price	χ^2 (12, N = 166) = 30.852, p = .002 The elderly see the phone as cheap, the younger the front desk
	Gender
Ease of use	χ^2 (4, N = 171) = 17.050, p = .002 Females see the phone as easy, men the front desk and websites
Multiple cues	χ^2 (4, N = 169) = 9.564, p = .048 Vrouwen meer telefoon, mannen meer balie
	Education
Usefulness	χ^2 (8, N = 169) = 19.566, p = .012 Higher educated see e-mail as more useful
Experiences	χ^2 (8, N = 166) = 17.890, p = .022 Higher educated have better experiences with websites
Service	χ^2 (8, N = 163) = 17.376, p = .026 Higher educated see telephone and website as giving more service
Contact speed	χ^2 (8, N = 167) = 20.286, p = .009 Higher educated see websites as better on contact speed
Multiple cues	χ^2 (8, N = 169) = 19.167, p = .014 Lower educated see front desk as giving more cues, higher educated see phone and websites as having more cues.
	Channel last used
Price	χ^2 (8, N = 212) = 104.047, p < .000
Ease of use	χ^2 (8, N = 215) = 79.117, p < .000
Usefulness	χ^2 (8, N = 213) = 54.348, p < .000
Experiences	χ^2 (8, N = 208) = 82.516, p < .000
Service	χ^2 (8, N = 207) = 58.849, p < .000
Contact speed	χ^2 (8, N = 211) = 39.942, p < .000
Immediacy of feedback	χ^2 (8, N = 215) = 61.820, p < .000
Multiple cues	χ^2 (8, N = 212) = 46.769, p < .000
Language variety	χ^2 (8, N = 206) = 53.307, p < .000
Personalization	χ^2 (8, N = 215) = 51.447, p < .000

Regarding channel used last, all effects are in expected direction, people associate the channel they used last with the channel characteristics. The table shows the test results of the demographic characteristics and channel choice related to the perceived channel characteristics. Only significant relationships (T < 0.05) are shown.

Digital Divide in eGovernment: The eInclusion Gap Model

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Abstract. The Digital Divide is a matter of fact in most countries. For instance, senior citizens, citizens without employment, or citizens with low education utilise online services in a distinct way, often to a lesser extent. Within this paper, we examine how such digital divide groups make use of different online services. Here, four types on services are taken into account and contrasted with each other: Internet usage, E-Commerce usage, E-Government for Information and E-Government for Transaction. As a result, we develop the E-Inclusion-Gap Model which addresses gaps between such service-specific usage and we discuss possible reasons behind them.

Keywords: E-Inclusion Gap Model, Digital Divide, E-Government, Technology Adoption.

1 Introduction

E-Government (Electronic Government) is the key element to modernising public administrations. In the move of the Lisbon-Agenda, all EU (European Union) member states have committed to implementing an E-Government-oriented strategy of public administration modernisation. Web-based information and communication technologies are intended to become the primary channel for public service delivery. According to the European Commission [1], in 2004 an average of 84% of all public services was available online in the EU member states and 40% of such online services enabled transactional E-Government. For 2007, the average level of the sophistication of online government services is the transactional level [2].

Despite such positive efforts to provide (transactional) E-Government services, analyses of usage numbers and user structures indicate that digital exclusion today is primarily a demand side rather than a supply side issue [3]. Here, especially senior citizens, and people without employment or with low education are still very much excluded from participation in electronic services [4-6]. In June 2006, the EU ministerial conference declared to strengthen digital integration by E-Government (electronic inclusive public services), to include elderly people (E-Aging), to widely distribute electronic services (geographical digital divide), to increase accessibility of e-public

services (E-Accessibility), and to strengthen digital competency (E-Competency) and cultural diversity by digital integration (cultural E-Inclusion). Such strategy reflects in specific efforts to provide citizen-centric services [7], which aim at understanding the problems and issues of those who are supposed to use them.

While both recent literature and political practice acknowledge the variety of problem spheres behind non-usage of the Internet and, in alignment, E-Government (see, for instance [8-10]), there is little empirical explanation of which distinct factors impact on the E-Government inclusion gap and to what extent [11, 12]. Accordingly, it is not yet clear to a necessary extent which actors should be involved in and hold responsibility for what share of an inclusion strategy in order to overcome the digital divide in E-Government. Taking the example of Germany, we therefore seek to address the research question of:

> *"What is the current state of inclusive E-Government and which factors could explain a possible inclusion gap to which extent?"*

In order to address this research question, the following section will relate our analysis to prior studies and the existing literature. Section 3 presents a model for detailed analysis of the E-Inclusion gap, after that the research methodology will be introduced in Section 4, focusing on a quantitative analysis of comprehensive newest Eurostat data from digital divide group perspectives. Following a comparative presentation and discussion of relevant data (Section 5), a comprehensive data interpretation shall offer explanations for inclusion gaps in (German) E-Government and identify potential operational strategies to overcome a digital divide in E-Government (Section 6). The paper will conclude with a summary of results and an outlook to potentially fruitful avenues for future research (Section 7).

2   E-Inclusion Related Work

The topic of E-Inclusion – participation for all in the digital, knowledge-based information society – has been gaining significant awareness across European public administrations with the upcoming of the European Commision's strategic policy framework program i2010 and its implications for an inclusive information society. In June 2005 the i2010 EU initiative[1] was launched and devoted to a set of broad policy guidelines and prioritises three major policy fields: creating a single information space, fostering innovation and investment in research and technological leadership in the EU and promoting an inclusive European information society. Focusing on the third pillar of the i2010 initiative, social inclusion in the digital information society (E-Inclusion) becomes the key to an inclusive e-society. However, the i2010 initiative does not just suggest inclusion in general, but specifies priority issues, such as more inclusive public services, which leads us to inclusive E-Government.

With the Riga Ministerial Declaration [1], the European Commission has further specified this goal of E-Inclusion in an E-Government context. Here, E-Government, in a wider sense, is to be understood as information technology (IT) usage in governments/public administrations. Within this paper, we will focus on those elements of E-Government that involve the demand side in terms of citizens. Accordingly,

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[1] http://ec.europa.eu/information_society/eeurope/i2010

E-Government here circles around the web-based electronic public service delivery. Such inclusive E-Government means, for example, that by 2010 all public websites are to be compliant with the relevant W3C common web accessibility standards and guidelines. Furthermore, it is stated that the design and delivery of key services and public service policies shall be user-centric and inclusive, "using channels, incentives and intermediaries that maximise benefits and convenience for all so that no one is left behind." [1] Finally it also proposes to ensure "that electronic documents are available in such a way that they can be used by people with disabilities in an appropriate and, where possible, EU-wide recognised" [13] format. With these statements, declared by 34 member countries, E-Inclusion in E-Government or inclusive E-Government becomes a key issue in many EU countries. A major measurable goal, set by the Riga Ministerial Declaration – and also motivating this study on barriers for inclusive E-Government – is the ambition to address E-Inclusion by reducing "the differences in Internet usage between current average use by the EU population and use by elderly people, people with disabilities, women, lower education groups, unemployed and 'less-developed' regions" [1] by half, comparing 2010 to 2005. With our study we seek to contribute to this timely topic and identify possible rationales for existing E-Inclusion gaps, so that future studies can focus on how to properly address these barriers to inclusive E-Government.

Much related work on E-Government and E-Inclusion exist. Core questions in this field are, for instance, of E-Government barriers [14], user perception of E-Government initiatives [15], Digital Divide in E-Government [16].

3   E-Inclusion Gap Model

Starting point for our analysis of the digital divide in Germany and other European countries is the assumption that there are several factors influencing the usage of E-Government by citizens, e.g. costs, qualification or trust [17]. However, not all of these factors are exclusive to E-Government. Some address the participation in the information society in general. In order to perform a more detailed analysis of these factors we introduce an "E-Inclusion gap model". In this model we distinguish different steps of participation in the information society and analyse the gaps between these steps.

The basis for taking part in the information society is access to the internet. Without this access, advanced services like E-Government or E-Commerce cannot be used by citizens. In the literature, access to the internet has been identified as an important factor influencing the adoption of E-Government, as well [18, 19].

Gap A (Total population – internet usage): Following the explanation above, the first gap in the model is the gap between the total population and the part of it using the internet. People in this gap do not take part in the information society as they are missing the basic requirement of access to the internet. Possible reasons for this gap are costs for internet access or mistrust towards the internet [17, 20].

The second figure used to analyse the barriers to the usage of E-Government is the use of E-Commerce by individuals. The usage of E-Commerce shows that an individual is willing and able to engage in more complex actions in the internet. Literature

points out similarities between the adoption of E-Government and E-Commerce [21, 22].

Gap B (Internet usage – E-Commerce usage): The individuals in this gap fulfil the elementary requirement of having access to the internet. However, they do not engage in transactions. Reasons for this might be security aspects [20, 23] or a lack of internet skills [24, 25].

The third figure of relevance in the model is the E-Government usage for information retrieval. In common models of E-Government service development the provision of information is the first step when deploying E-Government services [2]. Accordingly the retrieval of this information can be seen as the first step in using E-Government services.

Gap C (E-Commerce usage – E-Government usage for Information): People in this gap are performing transactions using the internet. Therefore they have the qualification necessary to engage in more complex actions and also no trust issues with the internet. However they do not participate in E-Government at all. This gap could be explained through a general preference for personal contact when performing government transactions or missing knowledge about the available E-Government information and services.

The fourth and last measure of the model is the usage of E-Government transaction. The use of transactional E-Government services by an individual marks the full usage of the potential of E-Government services. It therefore represents the desired for all individuals of an inclusive information society.

Gap D: (E-Government usage for Information – E-Government usage for transaction): Individuals belonging to this gap are aware of the presence of E-Government as they use it as an information source. However, they do not use E-Government for transactions. Possible explanations for this gap are missing trust in E-Government services [26, 27], deficits in the implementation of E-Government services or even the lack of transactional E-Government services.

4   Research Methodology

In order to answer the research question and populate the model, a comprehensive quantitative analysis of current Eurostat data from 2006 [28] on individual internet-based service usage was conducted. A methodological description of the survey is

Table 1. (Individual) Usage of Internet, E-Commerce, E-Banking, and E-Government and Corresponding Questions

Analysis Dimension	Question
Internet	I have used the Internet in the last 3 months
E-Commerce	I bought or ordered goods or services, over the Internet, for non-work use, in the last 3 months
E-Government for Information	I have used Internet, in the last 3 months, for obtaining information from public authorities web sites
E-Government for Transaction	I have used Internet, in the last 3 months, for sending filled forms

given by the European Commission [29]. While such data is secondary data and publicly available, a specific investigation into the in- and exclusiveness in European, and specifically German E-Government has not yet been undertaken. Consequently, the analysis of such comprehensive and high quality and comprehensive data (sample size: n=21.160) offers great potential to shed new light on the question of the status-quo of inclusive E-Government and on the question of which factors could explain possible inclusion gaps. Table 1 shows questions used to collect the data for the different variables.

Moreover, in order to allow for a deeper analysis of non-usage of E-Government services, reasons for non-usage (on an individual basis) are taken into account and range from non-availability of services over concerns about data security, privacy or costs to complexity of (electronic) public services (see Table 2).

Table 2. (Individual) Reasons for Non-Usage of E-Government and Corresponding Questions

Reason	Question
Service not available / to difficult to find	I'm not using Internet for dealing with public services or administrations, because: The services I need are not available on-line or difficult to find
Personal contact missed	I'm not using Internet for dealing with public services or administrations, because: I miss personal contact
Immediate response missed	I'm not using Internet for dealing with public services or administrations, because: I miss immediate response
Concerned about data security	I'm not using Internet for dealing with public services or administrations, because: I'm concerned about protection and security of my data
Concerned about additional costs	I'm not using Internet for dealing with public services or administrations, because: I'm concerned about additional costs
Too complex	I'm not using Internet for dealing with public services or administrations, because: it's too complex
Other reasons	I'm not using Internet for dealing with public services or administrations, because of other reasons

These two analysis dimensions (usage data and reasons for non-usage) are mirrored against potential digital divide group perspectives (besides population average: senior citizens of age 55 to 74, citizens with low education,[2] citizens living in thinly populated areas,[3] and citizens without employment).

5   Data: In- and Exclusiveness in E-Government

Analysing in- and exclusiveness of electronic public service delivery in Germany, data regarding internet, E-Commerce, and E-Government usage was contrasted (Table 3). Here, distinct levels of interaction in E-Government were differentiated (E-Government for information, and transaction).

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[2] Areas with up to 100 inhabitants per square kilometer.
[3] ISCED Education Levels 0, 1 or 2.

Table 3. Usage of Internet and E-Government by population groups in Germany

	Total Population	Senior citizens (55-74)	Citizens with low education	Thinly populated areas	Unemployed citizens
Internet	69%	37%	61%	65%	66%
E-Commerce	38%	15%	29%	35%	31%
E-Government for Information	28%	12%	17%	22%	29%
E-Government for Transaction	9%	n.a.	5%	8%	7%

Source: Data based on Eurostat (2006).

Table 4. eService Usage Ratio of Digital Divide Group Onliners and Population Average in Germany

	Total population	Senior citizens (55-74)	Citizens with low education	Thinly populated areas	Unemployed citizens
Internet	1.00	1.00	1.00	1.00	1.00
E-Commerce	1.00	0.74[a]	0.87	0.98	0.85
E-Government for Information	1.00	0.78	0.70	0.86	1.10
E-Government for Transaction	1.00	n.a.	0.56	0.91	0.76

Source: Data based on Eurostat (2006).

a - eService Usage Ratio describes the relation of specific eService usage within a certain digital divide group to eService usage among the average population, e.g., (SeniorCit.-CommerceUsers/ SeniorCit.Onliners) / (Aver.Pop.E-CommerceUsers/Aver.Pop.Onliners); (15%/37%)/(38%/69%)=0.74

In order to analyse the role of certain digital divide groups regarding the in- and exclusiveness of German E-Government, group-specific data on internet, E-Commerce, and E-Government usage was examined (Table 4).

All digital divide groups feature generally lower usage numbers in all analysed dimensions compared to the German population average (single exception: informational E-Government by unemployed citizens). Senior citizens are most affected by the digital divide and show lowest usage numbers in all dimensions.

Even though citizens with low education use the internet less often than the average (low educated: 61%, average: 69%), the usage of E-Commerce, and E-Government is over-proportionally little. For instance, 55% (=average E-Commerce Usage/average Internet usage; 32%/69%) of all population Onliners use E-Commerce, while only 47% of the Onliners with low education do so. Comparing these two groups, the Onliners' usage in E-Commerce (population average: 38%, low educated: 29%), and transactional E-Government (population average: 13%, low educated: 8%) provides a similar picture. Analysing the specific reasons for non-usage in such digital divide group perspectives led to the following key findings (see Table 5).

As for the population average, missing personal contact, concerns about data security, and the complexity of services are considered as major reasons for E-Government non-usage among digital divide groups in Germany. Concerns about data security were mentioned as reasons for non-usage of E-Government 1.27 times and 1.22 times more often by senior citizens resp. citizens from thinly populated areas than the population average. The complexity of E-Government services was mentioned as a reason for non-usage 1.24 times and 1.13 times more often by senior citizens resp. unemployed citizens than the population average.

Table 5. Reason for Non-Usage by Population Group in Germany

Relation to population average[a]	**Total population**	Senior citizens (55-74)	Citizens with low education	Thinly populated areas	Unem-ployed citizens
Service not available / too difficult to find	1 (21%)	0.78	0.96	0.99	n.a.
Personal contact missed	1 (48%)	1.08	0.92	1.04	1.03
Immediate response missed	1 (13%)	n.a.	1.04	0.94	n.a.
Concerned about data security	1 (40%)	0.93	0.85	1.03	1.11
Concerned about additional costs	1 (13%)	1.27	0.87	1.22	n.a.
Too complex	1 (24%)	1.24	0.95	1.01	1.13
Other reasons	1 (16%)	0.89	1.17	0.90	n.a.

Source: Data based on Eurostat (2006).

a   -   Relation to population average used to highlight group specific reasons
E.g., 0,78 (Senior citizens, Reason: Service not available) represents 16% (0,78*21%=16%) of the senior citizens giving that very reason.

6   Discussion and Interpretation: Gap Analysis

Operational strategies for inclusive E-Government necessitate a specification of the inclusion gap. In order to be able to derive toeholds for operational steps to overcome the given inclusion gap in German E-Government, a detailed analysis of the inclusion gap is necessary. Here, full inclusiveness could be understood as (process towards the) ideal state in which the number of actual users of a certain technology or service converges towards the number of all of its potential users. In this context, the total population (100%) can be considered as the full potential of users. On the other hand, only 9% of such total population did use E-Government for transaction (within the given time frame). The resulting inclusion gap concerning E-Government in Germany, in the widest sense, comprises 91%. However, to answer the question of why 91% of the population did not use transactional E-Government needs further explanation and differentiation. Therefore, the E-Inclusion gap model, which was presented in section 3, is applied to the data for detailed analysis (see Figure 1):
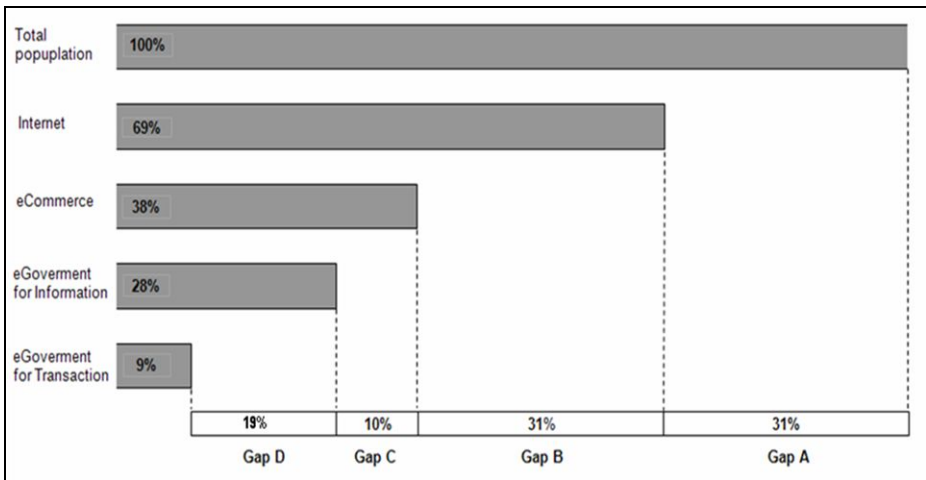
Fig. 1. E-Government Inclusion Gaps in Germany

Gap A: [Total Population – Internet Usage] In Germany, only 69% of the total population have used the internet (during the last three months). Consequently, a number of 31% of the population (Gap A) have not used the internet during this time frame. The following aspects could offer toeholds for interpreting such inclusion gap:

Infrastructure. E-Inclusion literature offers several issues which might impact on infrastructure availability. For instance, internet and broadband connection is not given in some under-populated areas (see internet usage in thinly populated areas is 0.65; compared with 0.69 average).

Accessibility. Taking into account the social and socio-demographical view on inclusion, age and education influence internet usage. For instance, senior citizens (of age 55 to 74) did use the internet in only 37% of all cases, citizens with low education in 61% (compared with 69% population average).

Gap B: [Internet Usage – E-Commerce Usage] While 69% of the total population have used the internet (during the last three months) only 38% of the population have used it for buying or ordering goods over the internet. This leaves a number of 31% of the population being online but not utilising E-Commerce services (Gap B). The following aspects could offer toeholds for interpreting this inclusion gap:

Security, trust, complexity. Besides such factors of infrastructure and accessibility (as discussed above), E-Commerce usage involves issues as security, trust, and service complexity [30]. E-Commerce habitually involves financial transactions and monetary investments, often requiring providing credit card details, security mechanisms, personal data etc. Here, for instance, 55% of all population Onliners use E-Commerce, while only 47% of the Onliners with low education do so. Moreover, only 41% of the senior citizen Onliners did use E-Commerce offerings during the last 3 months.

Gap C: [E-Commerce Usage – E-Government for Information] While 38% of the Germans used E-Commerce services (during the last three months) only 28% have used it for obtaining information from public authority websites (E-Government for Information). This leaves a number of 10% of the population being willing to utilise

E-Commerce but not E-Government (Gap C). The following aspects could offer toeholds for interpreting such inclusion gap:

Marketing and marketability. Besides such factors mentioned above (e.g., accessibility, trust, complexity etc.) marketing and marketability of electronic public services might influence on E-Government non-usage. While commercial services are habitually higher frequented than governmental services, still 21% of the German population state as a reason for not using E-Government that the demanded services would not be available or would be hard to find. While commercial internet has already developed and made use of technology potential, such as amazon.com, ebay.com or diverse social network services, public sector offerings are still missing such 'killer applications'. The simple fact of missing marketing budgets for advertising E-Government services, at least in German public administrations, adds on to such E-Government inclusion gap.

Personal contact. 48% of the population is reluctant to make use of E-Government services due to missing personal contact. Interpretations could be that a) E-Commerce services are nowadays much more established and perceived to be on an adequate security level, b) E-Government services are a more sensitive field to the citizens, and/or c) E-Government services and their underlying processes are perceived as very complex and intransparent so that people seem to be in need of reliable and personal guidance through the complexity of administrative issues.

Gap D: [E-Government for Information – E-Government for Transaction] 28% of the German population made use of informational E-Government during the last three months, while only 9% conducted online transactions in this area. This leaves a number of 19% 'looking, but not booking' (Gap D). The following aspects could offer toeholds for interpreting such inclusion gap [see also 31]:

Security and service complexity. While factors of security and service complexity have been discussed relating to transactional E-Commerce (38% usage), these issues seem to affect on transactional E-Government in an even stronger manner (only 9% usage). Here, 40% of the population name concerns about data security as a major reason for not using E-Government. Service complexity, mentioned in 24% of the cases, plays an evenly important role in non-usage behaviour. Regarding such complexity concerns, digital divide groups are strongly affected, e.g. senior citizens naming complexity as non-usage reason 1.24 times as often as the population average (unemployed: 1.13 times, thinly populated: 1.01 times).

Costs. Going hand in hand with security issues in E-Government, costs become an important reason of non-usage. This holds specifically true for transactional services which, in governmental fields, require rigid authentification and authorisation mechanisms. While E-Commerce often only relies on password or credit card details and E-Banking often utilises a PIN & TAN-method, transactional E-Government (in Germany) in most cases requires an electronic/digital signature. Investment costs regarding necessary equipment seem to be a major concern for senior citizens and people from thinly populated areas which mentioned costs as reason for non-usage of E-Government 1.27 respectively 1.22 times as often as the average population (giving this reason in 13% of the cases).

Taking into account these different inclusion gaps in German E-Government and their underlying currents, operational inclusion strategies have to be developed. This may include, for instance, general measures in order to further establish an inclusive

information society, e.g. measures to increase internet literacy, infrastructure projects etc. Such measures would increase the web usage among the population and/or specific digital divide groups (Gap A). On the other hand, one might also identify shares of the inclusion gap which might possibly be addressed by E-Government managers. For instance, corresponding measures could address creating a certain awareness among citizens for available services (Gap C) or engineering E-Government services in a way that they are less complex, easier to understand, bundled more accessibly [32], or guided by avatars, e-learning sessions etc. (Gap D).

7 Summary and Future Research

From the perspective of E-Government managers, there is an uncertainty of which measures to undertake in order to increase inclusiveness of electronic public service delivery. One can identify several problem streams, issues and barriers overlapping and adding upon one another creating the current picture of prevailing E-Government exclusiveness. But which measures are to be undertaken from the perspective of an E-Government manager, maybe on the local administrative level, and to which extent do such measures potentially impact in- and exclusion? Here, an analysis of different inclusion gaps in Germany, based on current Eurostat data, provided a more differentiated picture. 18% of the population make use of informational, but not transactional E-Government services. In this regard, concerns regarding service complexity, data security, and costs are mentioned as major reasons for non-usage. Such issues were even over-proportionally often named by senior citizens, people from thinly populated areas, and citizens without employment. Getting citizens 'from looking to booking' seems to necessitate measures aiming at the general population, but also measures taking into account specific digital divide group needs. Moreover, as 38% of the population utilise E-Commerce services, seemingly, e.g. accessibility, security, and service complexity issues did not hold back more than a third of the Germans from high value internet services. This leaves implications for E-Government managers to further improve electronic public services delivery and maybe also to stimulate an awareness for such services by means of marketing.

Further research might aim at collecting best-practices and successful projects on inclusive E-Government. Here, the analysis undertaken to identify specific inclusion gaps (E-Inclusion Gap Model) might help to structure such efforts.

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Engineering User Requirements for e-Government Services: A Dutch Case Study

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Abstract. E-Government services can be made more user-friendly by involving prospective users in the requirements engineering stage. In this paper, we present user requirements engineering activities for e-Government services, demonstrate their effectiveness by means of a case study, and reflect upon their use. We used a combination of interviews with clients and involved service employees, which resulted in a set of requirements covering the different needs of future users. The design based on these requirements was tested with fifteen potential end-users, using rapid prototyping and a citizen walkthrough. These sessions show that it is crucial to test user requirements with potential end-users to create an e-Service that successfully caters to clients, providing such things as personalization and interoperability in an e-Government setting.

Keywords: e-Services; requirements engineering, user-centered design.

1 Introduction

In the i2010 policy framework for the information society and media, the European Union advocates digitalizing public services, to make them more accessible and cost-effective [1]. The design of these electronic services should be geared to people with basic digital skills [1], which implies a heavy emphasis on user-friendliness.

Designing user-friendly systems in the domain of e-Government is not an easy task. Most services are only rarely used, so citizens do not have a mental model of how to commence and conduct their business using e-Government services [2]. Furthermore, many users lack the digital skills and bureaucratic competence needed to interact successfully with e-Government services [3]. In order to cope with the different characteristics and needs of a heterogeneous user group, users need to be involved at an early stage of system design [4].

This is the stage in which user requirements are elicited and engineered. *Requirements engineering* deals with "all the activities devoted to identification of user requirements, analysis of the requirements to drive additional requirements, documentation of the requirements as a specification, and validation of the documented requirements against the

actual user needs" [5]. Requirements engineering includes the *requirements elicitation* stage. This has been defined as "the specific processes of gathering, determining, extracting, or exposing software requirements" [5].

The importance of requirements engineering has been acknowledged by the computer industry, which ranks it as the second-most important design method [6].User involvement can be of great value in the stage of requirements engineering, resulting in more accurate user requirements, preventing superfluous features being included, and improving system acceptance [7]. Ultimately, this leads to increased usability [8] and usefulness [6]. Defining user requirements in an iterative design process can also save time and money in system development [8].

In this paper, we demonstrate the role that requirements engineering activities can play in the design of e-Government services, using the case of a social support portal. We will focus on the process and methods used to generate the requirements rather than on the requirements elicited in the study. By describing the process involved and reflecting on it, we want to contribute to the range of useful design methods, for e-Government applications.

In section 2, we will discuss the requirements engineering activities of past e-Government projects. Then, after we have introduced our case, we describe our requirements engineering approach, consisting of interviews, rapid prototyping and a citizen walkthrough with prospective users. Finally, we will reflect on the application of the methods mentioned above in the design process of e-Government services.

2   Requirements Engineering in Past e-Government Projects

Until now, few studies have systematically investigated which user needs and wishes potential clients of e-Government services have. Often, so-called "heavy users" are over-represented in the sample of users involved in the design process [9], which explains why the few reported e-Government requirements studies have come up with requirements that are either very generic or very sophisticated [9].

Wimmer and Holler [10], for example, listed several requirements for an e-Government portal based upon theoretical models, the characteristics of user groups, and usability criteria. Their requirements include "Simple and intuitive representation of the information and process flow" and "Integration with the back-office systems" (p. 177). However, average users were not consulted in this example.

Krenner [11] does include the average user in an extensive requirements elicitation study for an e-Government portal. He conducted interviews with experts, a literature review, sent out surveys to potential users and finally, held focus groups with potential users. His study revealed the need for a one-stop portal and identified several conditions necessary for high acceptance, like comprehensible navigation, understandable content and personalization (e.g., in the form of pre-filled forms). Lines et al. [12] elicited requirements for online e-Government forms for the elderly using semi-structured interviews and thinking-aloud sessions with senior citizens who had to fill in paper forms. As a result, Lines and her co-researchers were able to define functional and visual requirements for online government forms, as well as once again identifying the need for personalization.

Various e-government requirements studies, particularly [10], [11] and [12], have come up with similar sets of requirements:

1. *The system must have personalized features*. Tailoring system output can increase usability and efficiency [11]. In particular, pre-filled forms are seen as an added value for e-Government services. The potential benefits of personalization and its limitations were previously explained by Pieterson et al. [13].
2. *The system must provide all the necessary information*. The system must present all the information that users need to apply, receive and/or manage a service. Lines et al. [12] advocate providing this information at the beginning of a form.
3. *The system must provide assistance where necessary*. When a user encounters a question or chunk of information that needs clarification, the explanation should be nearby, preferably in the form of a link, either to a help file or webpage.
4. *The system interface must have a good layout*. More specifically, the interface layout needs to be clear [12], consistent [11] and intuitive [10].
5. *The system must provide easy and comprehensive navigation*. Since many users of e-Government services are incidental users, navigating through the portal or site needs to be easy and efficient. This holds for both the information system and the service delivery process. The importance of ease of navigation was underlined by De Jong and Lentz, who found that city websites often suffer from fuzzy labels, search engines which give irrelevant results, and a lack of cohesion and structure [14].
6. *The system must use clear language*. Citizens must be able to understand the content, so text should be written in simple and colloquial language. The importance of clear language was confirmed in a study by Klaassen et al. [2].
7. *The system must be accessible*. Since a considerable part of the user group will consist of senior citizens and people with disabilities, the system must be designed to be accessible for everyone. For a more extensive list of requirements on accessibility for governmental websites, refer to [15].

Despite these similarities, some requirement studies make different recommendations. For example, Wimmer and Holler [10] advocate a login procedure early in a visit to the site in order to make personalization possible, whereas Krenner [11] states that logging in should be postponed to the point where a user wants to perform transactions which require identification or verification.

Although the requirements listed above are a good starting point for the design of e-Government services, they remain generic. They could just as easily apply to commercial websites or e-Services. Generic requirements do not provide system designers with specific instructions. Because these requirements allow ample room for interpretation, designers may translate them into a design which differs from what requirements engineers may have initially visualized. We think it is wise to use a set of generic requirements, and then expand these, formulating specific requirements for each e-Government service domain (e.g., applying for a tax return, for state benefits or pensions, or for a building permit). In this article, we will present the case of applying for social support to demonstrate the requirements engineering activities and their results.

3 Case: A Social Support e-Service

In the Netherlands, citizens who need help because of physical or mental ailments can make use of the Social Support Act (in Dutch: Wet Maatschappelijke Ondersteuning). For example, Maria, a senior citizen who is temporarily impaired because of a hip replacement surgery, applies for social support to pay for help in the house for a limited number of hours during the period that she is not able to do the housekeeping.

When applying for social support, Maria has two options: help in kind, or a personal budget with which she can hire her own help. When opting for help in kind, a helper is appointed by the municipality or a care agency. The municipality or agency takes care of the paperwork associated with employing personnel. If Maria opts for the personal budget, she becomes an employer and hires her own help, which lets her choose her own helper (e.g., a person she knows well). However, she is also obliged to comply with the labor laws governing employers, like keeping a salary administration.

The paperwork involved in applying for social support is a huge burden, especially when the applicant chooses a personal budget. One particular application form includes as much as 20 appendices! The applicant is confronted with many difficult rules and regulations, which can differ from one municipality to the other. Because the Social Support Act is implemented in so many different ways, it is not possible to provide user support at the national level, which makes it particularly hard for small municipalities to offer good support.

There is so much red tape associated with applying for social support with a personal budget that this is an excellent candidate for digitalization. The service provider can increase their efficiency, at the same time reducing the administrative burden on the citizen. After all, the citizen is already facing a difficult situation that is why she is applying for social support in the first place.

We decided to design a demo of a portal that would give access to all information and services related to social support, organized around the scenario of 'needing support'. We assumed that all the government agencies involved would have interoperable systems, which could provide and exchange information about an identified user. We realize that this assumption brings along great challenges with regard to the implementation of such systems in different government agencies. However, it lies outside the scope of this paper to deal with them.

4 The Requirements Elicitation Process

We elicited requirements for the social support portal with two sets of interviews. For the first set, we visited six citizens who had recently completed the process of applying for social support, either for themselves or for a relative. Although this number may seem small, the interviews were conducted right after the Social Support Act was implemented. Therefore, the number of citizens that made use of it then was very limited (the city of The Hague with almost 500,000 inhabitants, for example, only had 40 applicants at that moment). For the second set, we spoke with six employees of agencies or municipalities involved in the application or administration of social support services.

The clients we interviewed had all applied for social support with a personal budget. Five of them had been granted a personal budget, while one decided to abandon this option, receiving help in kind instead. One client was represented by a family member who also managed the client's budget (since the client suffered from dementia). The interviews were semi-structured, with each of them addressing the following topics:

- Demographics of the client (age, housing situation, etc);
- Incidents during the application process or service delivery that the clients viewed as critically affecting their satisfaction (or dissatisfaction) with the process;
- The chronological application process as perceived by the client;
- Expectations of a digital social support service.

Three of the interviewed employees worked at a municipality and three at a government agency responsible for the salary administration of social support clients. These interviews were also semi-structured, addressing the following topics:

- The translation of a client's question or situation into an actual service;
- The information required of the client;
- The role of different organizations in the service supply chain, current information-exchange processes, and trust in the quality of information from other agencies;
- Expectations of a digital social support service.

Interviews have been shown to be an adequate method for discovering the structure of procedures, as perceived by stakeholders [16].

5   The Formulation of Requirements

All interviews were audio-recorded and transcribed. Transactions that an e-Service should provide, as well as problems or personal circumstances that it should consider, were formulated as portal requirements by one of the authors, using the Volere method [17]. The requirements were then checked by two other authors. Any disagreement about formulation or attributes was discussed until unanimous agreement was reached.

The interviews with the Social Support clients resulted in 63 requirements and interviews with employees in 39. Together, these requirements cover the entire system domain. Where previous requirement studies have focused only on the product itself, following Lauesen [18], we see the system as comprising both the product and its primary users (citizens and employees of organizations in the service supply chain) in their context of use (including user support and other service channels). We think this approach is more realistic and, therefore, increases the chance that the system will be effective for both users and employees.

As an example, we will show and discuss the formulation and validation of two requirements. They are presented in the Volere template (see Figures 1 and 2). This template enables the requirements engineer to systematically document requirements and can serve as a guide for integrating them into the system, as well as evaluating them afterwards. The template contains the following fields:

Requirement #. Each requirement is assigned an individual ID.

Requirement Type. Each requirement is classified as a certain type. Requirement #28 is classified as 'functional' (describing a function to be implemented) and Requirement #32 is typed as 'content' (describing a format in which content has to be displayed). Other types include usability requirements or data requirements.

Description. This is the core of the requirement, as it concerns the content, often formulated in a sentence like '*the system must…*' or '*the system should…*'.

Rationale. The rationale explains the underlying reason for the requirement.

Source. The source refers to the requirement's origin (in this case one of the interviews).

Fit Criterion. This criterion shows how successful integration of the requirement into a system (prototype) can be assessed. In the case of a functional requirement, such a criterion is unnecessary, since a function is either implemented in the system or not.

Customer Satisfaction and Dissatisfaction. These fields indicate the consequences of implementing the requirement (or not) on a 5-point scale. If customer satisfaction is rated as 1, implementing the requirement does not affect customer satisfaction much, while a rating of 5 implies that customer satisfaction is significantly boosted. The same scale applies to customer dissatisfaction. The requirement's priority is determined by the result of these two scales.

Priority. In this case, a requirement could have high, average or low priority. A high priority means that integrating the requirement in the system design is crucial for correct functionality or high adoption by users. A requirement with average priority is

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Requirement #: 32   **Requirement Type:** Content

Description: The system must enable clients to easily translate information regarding social support to their own situation.

Rationale: Some of the potential clients are not sure whether they are eligible for social support.

Source: Client interview 2 and 6; Employee interview 1 and 3

Fit Criterion: A citizen walkthrough with prospective users must show that these clients have a better understanding how social support applies to their personal situation, thanks to the system.

Customer Satisfaction: 3   **Customer Dissatisfaction:** 3

Priority: Medium   **Conflicts:** none

History: Created May 1, 2007

Fig. 1. Requirement #32 in Volere template

important for correct functionality or adoption by users, but will not have critical effects if not implemented. A low priority, finally, means that a requirement contributes only marginally to correct functionality or high levels of adoption.

Conflicts. Possible conflicts with other requirements are reported here.

History. The history provides a record of changes made to the requirement.

Requirement #: 28   **Requirement Type:** Functional

Description: The system must provide the clients with the option of collecting data from another organization involved in the service supply chain, where the data is already known.

Rationale: Having to provide the same data more than once to a government agency involved in the service chain should be avoided.

Source: Client interview 1, 2, 3 and 5; Employee interview 1 and 3

Fit Criterion: Not applicable

Customer Satisfaction: 4   **Customer Dissatisfaction:** 4

Priority: High   **Conflicts:** none

History: Created May 1, 2007

Fig. 2. Requirement #28 in Volere template

6   Requirements as Input for Rapid Prototyping

Our next step was to test the validity of the formulated requirements, when they had been integrated in the system. A cost-effective and fast way to do so is with a low-fidelity prototype or demo, which is tested using a qualitative data gathering method such as focus groups, interviews or a citizen walkthrough. Such a prototype can help to assess the validity of the requirements and the user acceptance of the design decisions reflected in the interface [5]. Our prototype consisted of screen designs which visualized functionality and interaction. These screens were the result of creative design sessions and inspired by a fictional scenario of Mrs. De Vries, who considered applying for social support by means of the Social Support Portal. This portal contained functions and an interaction design which were derived from the user requirements.

Requirement #32 was integrated in what we call 'personalized narratives' [19]. In order to make it easier for clients to apply the regulations to their own situation, and to assess their eligibility for the service, we made it possible for them to interact with a story. First, Mrs. De Vries had to choose the story that most resembled her situation out of four stories about fictional social support clients. Then, she had to adjust the

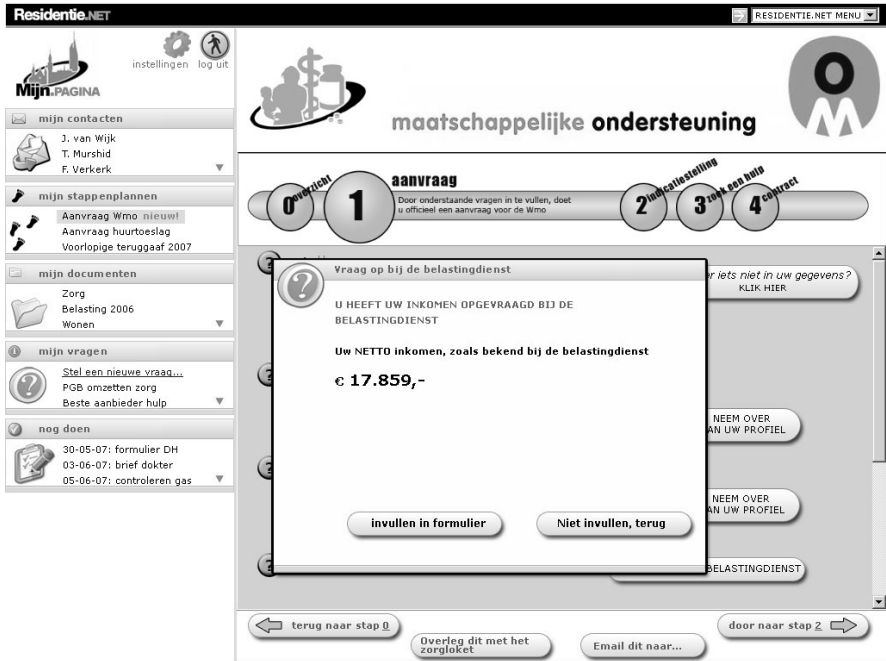**Fig. 3.** The adaptable story of Remco (text in Dutch)

Fig. 4. Collecting net income from the Dutch Tax Administration (text in Dutch)

parameters in the story to make it resemble her own—e.g., by changing the net income in the narrative. This automatically adjusted related parameters, such as the subsidy to be received. In this way, she could quickly assess her eligibility for social support. Figure 3 shows the fictional story of Remco, which can be adjusted to the client's personal situation.

Requirement #28 was visualized by means of a form in which Mrs. De Vries was asked to provide her exact net income. Of course she could just look it up in her own files, but she could also retrieve the data from the Dutch Tax Administration. The second option was chosen in the scenario and was visualized (see Figure 4). After clicking on the button 'Retrieve from Tax Service' in her digital form, a pop-up screen appeared indicating her net income. She could then either transfer this number to her form, or ignore the result and fill in the field herself.

Based on the reactions of the 15 participants, the demo was understandable: they understood how the portal worked.

7   Evaluating the Prototype with a Citizen Walkthrough

We tested user acceptance of the way the requirements were integrated and presented in the prototype using a citizen walkthrough, based on the fictional scenario. Fifteen people participated, all of whom were currently involved in, or had recently been involved in, applying for social support; in other words, they were realistic representatives of the portal's prospective end-users. These participants were recruited by a municipality, involved in the project. The proportion of seniors in our group was high, including a 79 and an 81-year old participant; however, this is in line with the population of social support clients. We visited the participants in their homes, as some were physically unable to travel.

During a typical session, we introduced the scenario of Mrs. De Vries and showed the accompanying screens on a laptop. After showing each screen, we questioned the participants about the visualized functionality. In the case of requirement #32, shown in Figure 3, we asked the participants two standard questions and two specific questions:

- Standard: What do you see on this screen, and how do you expect to work with this screen?
- Standard: Is all the information that you think you need present?
- Specific: Does this approach fit with the way you normally seek information?
- Specific: Do you always try to apply the information you find to your own situation? How do you usually apply information to your own situation?

In the case of requirement #28, shown in Figure 4, we asked the participants the two standard questions and two specific questions:

- Specific: For you, what are the benefits and disadvantages of retrieving data from other organizations and transferring them directly into your own form?
- Specific: Do you like this way of filling in a form?

The responses were mixed regarding the way requirement #32 was represented, and shown in Figure 3 in the low-fidelity prototype. The majority of the participants

reacted enthusiastically, praising the personal approach and the ease with which they could apply the regulations to their own situation and check their eligibility for social support. However, some participants were negative, saying they did not like to supply personal information or felt "treated like a child." This means that the fit criterion (see Figure 1) was not met, and we were forced to conclude that the representation of requirement #32 in the prototype was not totally successful. The user comments indicate that some people prefer to see the formal text of regulations, so these should also be present in the portal.

The reactions to the way requirement #28 was represented, and shown in Figure 4, were mostly positive. All but one participant appreciated the functionality and its representation. The participants appreciated that it would make filling out the form easier, faster, and would reduce the risk of user errors.

8   Reflections and Conclusion

Using a citizen centric requirements engineering approach, we were able to develop a user-centered e-Government service. By first eliciting the prospective clients' wishes and needs, interviewing existing clients and involved employees, we were able to list valid and value-adding requirements, which the designers could use when creating the prototype.

However, merely listing requirements is not enough, as our low-fidelity prototype evaluation showed. The way requirements are presented in a system (prototype) leaves much room for interpretation and design decisions. This interpretation should be checked with prospective users: does the representation fulfill the requirement in a way that is acceptable and attractive for the user? Requirement #32, which used personalized narratives, shows that a design based on a requirement originating from users does not automatically meet all users' demands. This shows that repeated consultation with potential users is necessary if user requirements are to be successfully implemented.

The success of our approach was reflected in the interest our demo portal has generated among e-Government designers and developers. For example, the low-fidelity prototype has been adopted by one of the largest cities in the Netherlands as their primary model for developing a full-fledged, interoperable and personalized social support portal. The results of the citizen walkthrough were taken into account in the design of this e-Service. Furthermore, the approach will be used in future projects to develop e-Government services.

Our case study shows that the requirements engineering activities that we performed did help inform the design in the complicated context of e-Government services aimed at a user group who have limited digital skills and who are unfamiliar with the bureaucracy. The different characteristics, needs and wishes of the user group were successfully revealed in our interview sessions. The complete process enabled us to create a way in which complicated regulations can be effectively communicated to clients. Finally, our approach provides a starting point for representing essential e-Government features like integrated services and personalization in a way that is accepted and appreciated by users.

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Transparent Complexity by Goals

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Abstract. Making the teleological structure of e-government explicit can contribute to reduce its complexity. E-government can be viewed from distinct standpoints – from authorities and citizens, but also from conception and construction. This view of administrative and legal informatics requires paradigmatic changes in the effective development of e-government. We have an impression that a currently dominant normative thinking is not enough to solve specific problems of e-government. Here a new concept of legal teleology is required. We propose to supplement norms and even structural parts of a whole legal system with teleological relations. This will form a separate structural layer of legal knowledge representation. Such a layer can contribute to metadata of legal documents. This is important in the search of legal documents and information retrieval. Proposed notation A te B contains three elements: a basic element A, a target element B and a teleological relation te.

Keywords: Teleological structures in law, goal concept, legal engineering, legal drafting, e-government.

1 Introduction

Making teleological structure of e-government transparent contributes to understand it. Thus its complexity is reduced. Here theoretical concepts have to be concerned too.

Legal order as a societal instrument is characterised by mostly implicit and rarely explicit teleological structures. Teleology concerns not only a single norm but also a whole legal system. An early attempt to analyse legal teleological structures was "Interessensprudenz" done by von Jhering [9, 10]. But nowadays the recent challenges of e-government (Traunmüller [23], Wimmer [27]) require a new concept of legal teleology. The concept of governance entails teleology, too. This lays in Westerman's idea "governance is governing by goals" [26].

Therefore the "goal" deserves to be placed in a top legal ontology. This is especially in the branches of law where legal materials are in the process of development. On the one hand, the goal concept can be treated as a generalisation of "objective", "purpose", "aim", "result", "value", "end", etc. These high-level words are widely used in the legal domain. For example, the purpose of the law is considered in Hart's example of the vehicle in the park [8]. On the other hand, the goal generalises

low-level measurable results such as targets, benchmarks, best practices, etc. The second argument is a teleological method. It is among major legal methods [15].

We see several reasons to consider goal concepts. First, teleology is innate in normative legal systems. Therefore the representation of teleological structures should be an inherent task of legal knowledge management. Second, legal reasoning, especially by non-experts in law, is driven primarily by goals then by norms. Third, teleological structures are mostly implicit and rarely explicit. Therefore their representation is a true challenge in knowledge management. Fourth, teleological statements are extensively used in legal drafting. Listing the purposes of a statute in its preamble is not enough.

Kelsen in his "Reine Rechtslehre" [13] focuses on the model of an action within a norm. The norm is treated as a rule of social behaviour. We think that action-oriented models have to be supplemented with teleological relations.

Sartor [20] treats the goal as a fundamental legal concept: "More articulate normative notions and, in particular, the idea of a right, cannot be built on the basis of obligations and permissions alone. Such notions embed a *teleological* perspective, namely, a focus on purposes or interests (final or intermediate values, ends, objectives) which a normative proposition is meant to serve …". Sartor [20, p. 108] proposes a notation $A \Uparrow^G$ "to mean that the adoption of a proposition A advances the goal (or the set of goals) G". Artosi et al. [2] while proposing elements for a formalisation of the theory of norms treat a propositional assertion and an action as constituent elements of a norm. We think that goals have to be assigned to other elements of the legal system too.

Since legal teleology was introduced to the AI&Law community by Berman and Hafner [3] in 1993, the formalisation has been much discussed a decade later (see *Artificial Intelligence and Law*, vol. 10(1-3) September 2002).

There are more theoretical beginnings in this direction. Teleological relations enter a broad field of relations. For example, Kaufmann [11] examines ontology of relations (*Relationenontologie*). There exist many subterms of different relations: Radbruch [19], Tammelo [22], Kaufmann-Hassemer-Neumann [12], etc. The comparison, symbolisation and translation into a logical notation are for future.

Normative teleological structures can be compared with institutional teleological structures. A viewpoint "not rules, but roles" leads to analysis of, first, von Jhering's Interessensprudence [9, 10], then MacCormick and Weinberger [18], etc.

Summers [21, p. 42-47] while speaking about a form and function says that "the overall form of a functional legal unit as a whole must be designed to serve purposes". He distinguishes the following types of purposes of a functional legal unit: (1) founding purposes, (2) internal operational purposes, (3) public policies, (4) political values; general values of the rule of law.

These works show possible methods to tackle a problem. Thus, teleological structures in law can be approached on a methodological basis.

Our exploration of teleology was also inspired by other reasons. First, the following three concepts are not well distinguished in legislation and even in legal theory, namely, (1) the *nature* of law, (2) the *functions* of law as well as of an authority and (3) the *purposes* of an authority. For example, an official speaks about the computerisation of a country as an aim of e-government. However, here the computerisation is a *means* – not the goal. Being the means it can contribute (positively or negatively) to certain values, e.g., educated society, democracy, the right to information, etc.

The second reason is that a teleological method is widely used in the European Union law. Purposive interpretation is by far the most used method by the European Court of Justice [24].

2   Requirements and Goals of e-Government

Teleological statements are especially found in the legislative workflow: governmental drafting, parliamentarian decisions, publication of the valid laws, etc. In high-level political and legal acts the concept of e-government is expressed in terms of goals (see, e.g., European Information Society programs eEurope 2005, i2010, etc.). In particular, "It is widely accepted that the goal [of e-government] consists in increasing the performance of the governance" [5]. Thus the concept of e-government is related with the concept of governance, see, e.g., [7]. Grönlund [7] identifies three goals as typically explicitly mentioned:

1. more efficient government
2. better services to citizens
3. improved democratic processes

Goal orientation in e-government is inherited from the European Union law which is very goal-centred. The objectives of the EU are set in Article B (now 2) of the Maastricht Treaty on European Union. Article I-2 of a constitution for Europe lists the values of the Union.

Political goals, legal goals and information system goals shall be distinguished. They are represented in the acts of different levels and in different terminology. For example, a very high-level political aim "common market" can be decomposed to the AND-tree of four sub-goals of a type "right": "free movement of goods", "free movement of persons", "free movement of services", "free movement of capital".

The detailed analysis of e-government goals is done at lower level issues. Requirements can be extracted from e-government issues [23]. General requirements for e-government are examined, e.g., in [5]. Requirements engineering methodologies distinguish between functional requirements, non-functional requirements and goals. Examples of business requirements for digital government (DG) as they are categorised by Costake [5] in the form of a goal tree:

- General
  a. Transparency and accountability of the Governance ...
  b. Easy access to the public information ...
  c. Easy access to DG services; etc.
- Citizens-oriented
  a. User friendly access to public information and services ...
  b. International recognition of personal e-documents ...; etc.
- Business-oriented
  a. Provision of complete online public e-services ...
  b. E-procurement for public acquisitions; etc.
- Oriented on users in state institutions
  a. Possibility to simulate and assess the effects of drafts decisions or regulations ...
  b. Decision support services; etc.

3   Why Should the Formalisation of the Goal Concept Be Taken Seriously?

In the classical theory of norms of Kelsen, the norms are not associated with values [14]. Kelsen devotes the Chapter 2 to a norm and means-goal-relationship. This comprises the teleological necessity between a norm and a goal. However in the contemporary context of e-government and governance, the goal emerges as a primary concept.

Who shall bother about goals: politicians, lawyers, governmental agencies or software engineers? "The prevailing attitude of most legal scholars or students of legal theory is to regard policy-making – with or without politics – and governing – with or without government – as activities that should be kept separate from law. Lawyers deal with the product, not with the process that precedes it. They usually deal with rules and regulations, but not with the art of rule-making" [26], cf. [28].

Another reason for the lawyers to be not interested in the goals can also be mentioned. The practicing lawyer is "continuously engaged in demarcating valid from invalid law". Such a position can be viewed as hardly sustainable: "If we want to understand the products – the rules and principles ..., we should also understand the process that has helped to form those products" [26]. Westerman further characterises governance as new style and introduces the concept of *result-prescribing norms* (RP-norms) [26]. In the EU law, this can be observed in framework-directives. Here one should notice that Article 249 (ex 189) EC Treaty sets: "A directive shall be binding, as to the result to be achieved ..., but shall leave to the national authorities the choice of form and methods". Thus the nature of directives is to formulate aims and goal-prescriptions. Examples of the aims are "reliable care", "good labour conditions", etc.

The Westerman's statement "The conventional rule as a device that indicates a concrete manner to achieve ends is replaced by direct prescriptions of those ends. Rule-making is supplanted by end-setting" [26] suggests us the following formalisation. A classically formed action-centred rule

$$\textit{do action A to achieve the goal G} \tag{1}$$

is replaced with the rule which has an open action X:

$$\textit{do whatever X to achieve the goal G} \, . \tag{2}$$

Norm-addressees are paradigmatically changed from individual ones to networks of numerous institutions [26]. A next issue is benchmarking of low-level goals. This can be compared with an "open texture" problem. Suppose a high-level goal "reliable care" be decomposed to contain a sub-goal "short waiting list". Then "the question immediately arises what should be counted as sufficiently "short"" [26]. Thus specifications of goals lead to "performance-indicators that enable the various supervisory bodies to monitor the degree in which the desired aims and policies are realised" [26]. The requirement "at every more specific and concrete level, there is less scope for alternatives routes by means of which the results can be obtained" accords with general top-down decomposition principles of systems design.

There are reasons to prefer goals to rules when disadvantages of rules emerge. The difficulties are discerned in [26]:

1. the choice of rules
2. the enforcement of rules
3. the reception of rules
4. the effectiveness of rules

The above listed difficulties also accord with the preference of declarative knowledge when disadvantages of procedural representation are observed. The nature of requirements engineering (RE) is to tell *what* to attain not *how* to attain.

Rules are useful when goals (interests, values) are conflicting. Consensus on shared goals (what is vital in the concept of governance) leads to explicit representation of the goals. The tenet that people should reach consensus leads to the emphasis on learning [26]. A shared goal (general interest) should be learned. Here e-government can serve as a collective process of guided learning.

"Tyrannical goals" are identified in demarcating a "facilitative rule (allowing people to pursue their own goals) and a manipulative rule (serving the interest of the legislator only)" [26]. Such tyrannical goals are avoid-goals that are distinguished in RE. Explicit representation of goals might serve when "within governance, there is no systematic place for such a forum in which conflicting interests can be brought together" [26]. Identification of the means as heavy or lighter in order to achieve certain goals can contribute to the principle of proportionality. Here the following formalisation can be extracted:

1. A mean M1 serves to achieve the goal G
2. A mean M2 serves to achieve the goal G
3. M1 is heavier than M2

4 Comparing Goals in the Legal Domain and Requirements Specification

We advocate the following approach: a teleological network in the legal domain shall be treated similarly to the goal model in requirements engineering (RE). We hypothesise on the assumption that a legal act is a system. Consequently, system design methods might be used in legislative drafting [6].

We make a comparison of two systems: a legal act and a software system. A norm corresponds to a requirement. Structural elements of the norm and of the requirement are compared correspondingly. The subject of the norm corresponds to the agent of the requirement. The *telos* of the norm corresponds to the goal of the requirement. A whole teleological network in a legal domain corresponds to the goal model in RE.

One of the benefits of goal analysis in information systems RE is to identify conflicting goals [25]. Conflicts shall be identified as early as possible in order to improve the design of a system (of a socio-economic system too). In the legal domain conflicting goals are also a reality. They are identified in legislation, observed in law enforcement, claimed in judicial procedures, etc. An example is procedures of a bureaucratic agency versus efficiency of management. This can be observed, e.g., in public procurement when bureaucratic tendering outweighs price reduction. The

nature of a conflict in the legal domain is expressed in different terminology than in goal-oriented requirements engineering. Here different sorts of models (goals, agents, objects, actions) are used [16]. A goal is a prescriptive assertion that captures an objective which the system-to-be should meet [25]. The identification of conflicting goals is one of the purposes of a graphical notation. AND/OR tree can serve this purpose. We think that notations which are used in goal-oriented RE methodologies can be applied in legislation too. A first step is to identify the goals.

Different types of goals are distinguished in software engineering. For example, KAOS goal-oriented requirements engineering methodology [16] distinguishes:

- *achieve* goals. They require that some property eventually holds. ◊G
- *maintain* goals – some property always holds. □G in deontic logic
- *ceas*e goals – some property eventually stops to hold. Opposed to *achieve*
- *avoid* goals require that some property never holds. Opposed to *maintain*

Additionally, *optimise*, *test*, *query*, *perform* and *preserve* goals are distinguished in multi-agent systems, see, e.g., [4] about Belief-Desire-Intention agent systems.

In KAOS [16], the bottom-level goals in a goal tree are assigned to agents. The agents are responsible for these bottom-level goals. Time logic is used to represent the semantics of goals.

The variety of goal-related concepts in requirements engineering demonstrates the expected variety of concepts in the legal domain.

5   Structure of Teleological Notation

The teleological structure we propose contains three elements: the basic element *A*, the target-element *B* and the teleological relation *te*→. The proposed notation is

$$A\ te{\rightarrow} B\ . \tag{3}$$

Within the legal taxonomy there are different semantic kinds of legal teleology, depending on the different teleological order like time horizon, e.g., $A\ te^{short\ term}{\rightarrow} B,$ or $A\ te^{long\ term}{\rightarrow} B$.

Pragmatically, the teleological structure is embedded within a speech act. Besides, it is necessary to represent the speech act by a separate notation, e.g., *te-statement(…)*. Also the speech act can be qualified in different ways, e.g., legal, political, scientific: *te-statement^{legal}(A te→ B)*, *te-statement^{political}(A te→ B)*, or *te-statement^{scientific} (A te→ B)*. Consequently, the notation can lead to a "theory of relations" in law.

The Aristotelian philosophical concepts of *entelechie, telos* and *finis* [1] can be treated as the roots of the teleology of current normative systems. Aristotelian *entelechie* denotes the immanent goal *telos* of a thing. We represent the *telos B* of a thing *A* as *A te→ B*. The natural law has been developed around the concept of *entelechie*. A norm allows behaviour which aims at a positive *telos* and forbids behaviour which aims at a negative *telos*.

We advocate the relational nature of goals. In such a context three subjects can be identified:

1. The first subject establishes a goal relation $A \text{ } te{\rightarrow} B$.
2. The second subject evaluates the goal B. For example, B is positive or negative.
3. The third subject establishes a norm $N(A)$ concerning the goal relation.

According to Kelsen [13], a speech act (*Rechtssatz*) about the norm must contain no evaluation of the goal. This is the essence of his Pure Theory of Law.

We distinguish between the following kinds of goals:

- *instrumental* goals. A goal is treated as a "product"
- *situational* goals. A goal is treated as a "social landscape"

Here we consider different kinds of the *telos B* in $A \text{ } te{\rightarrow} B$. In *instrumental teleology*, A is an instrument – a (technological) means – in order to reach the goal B which is treated as a "product". In *situational teleology*, the goal B is treated as a certain situation and the action A leads from one situation to another. Here the goal B is not a product, but a "landscape". The following metaphors can be provided. The instrumental teleology is compared to the teleology of "hands". The situational teleology is compared to the teleology of "feet". The hands produce products; the feet take us to another landscape. An instrumental goal sets a certain step. A situational goal sets not a step but another "campsite", a migration goal, or the social scene which may be even not declared.

Next we distinguish between two projections of goals:

- *officially binding* goals. A subject matter to be represented explicitly in a legal act.
- *subjective* goals. May be expressed by an external evaluator

The two kinds would be visualised differently.

The two concepts – a *goal* and a *means* – have to be distinguished. Usually a means to achieve a certain high-level goal can be treated as a goal, a lower-level one. Such coercion can go recurrently. This can be observed in governance and public administration law. For example, the means "computerisation of a country", which is set by a high-level governmental agency, is treated by lower-level agencies as a goal. The lower-level agencies decompose the goal to sub-goals, set lower-level means and pass them to next lower-level agencies.

6   Teleological Phrases in Legislation

Legislation is a kind of societal practice and, therefore, can be approached from teleological point of view. However, two forms of teleology have to be distinguished: *explicit* and *implicit*. Firstly, explicit teleological formulations are in the focus. They can be provided in the texts of legislative materials, both in the texts of laws and in accompanying texts. Implicit teleological formulations are next. However, implicit teleology forms a contextual dimension which frames the legislation. Within this analytical framework one can try to cut teleological phrases and then formalise them as newly-discovered structures.

Legislative practice often uses teleological phrases. Teleological statements extracted from such phrases can be represented by the proposed notation *Act $te{\rightarrow}$ Goal*. Multiple teleology is feasible too. The goal may be formed of a set of sub-goals,

e.g., *Act te→ {g₁, g₂,…, gₘ}*. Here the column can be interpreted as a certain operation, e.g., And, Or, Xor. Decomposition of goals leads to graph-like structures that are already used in goal-oriented requirement engineering [25], where goals are associated with actions and agents. Actions in legal norms are expected to have such a similarity too.

7   Norm and Goals

The substitution of a norm *N* for *A* in (3) leads to *N te→ B*. Our focus is on the immanent teleology of the norm (which is treated as an obligation). Here the norm is a teleological instrument to realise a certain action. The norm being a technical instrument leads to social techniques of normativity. Our starting axiom is that every norm has such a "teleological shadow". We will try to build this semi-automatically.

Making the immanent teleology of a norm observable requires a paradigmatical change in legal theory. For a long time efforts are being made to translate the textually formulated norm into a formal language. The purpose of these efforts in theory was to develop the logic of norms. The advantage of this logic is the formalisation and, consequently, the operationalisation of norms. Deontic logic helps to express a prohibition with demand and a right with the permission. Deontic logic is presumed in legal expert systems, because different variations of normative consequences can be put on sound logical basis.

Our starting point is within the conception of deontic logic. We propose to include the teleological surrounding of norms into theoretical analysis. Consequently, a kind of teleological net occurs. Teleological relations point to a variety of types and suit to better networking than isolated norms which indicate actions. The norms may also constitute internal structures, e.g. grouping according to a common condition. But the teleological structures are unevenly better suited to networking than separate norms. Hence, our aim is, first, to extract teleology from the norms and, second, to connect the norms with teleological nets.

Legal teleology is also important in another respect, namely, public awareness of law. We hold that public consciousness takes better teleological dependencies than separate norms. Citizens find themselves in certain roles and even more or less unaffected by legal rules. On the other side, the citizens, who usually think teleologically in practical situations of life, are separated from the legal teleology. For a citizen teleology of law is more important than textuality of law.

Another aspect of application is found in the development of databases and search strategies. We hope that emphasis on a teleological component will bring creative impulse for the development of legal databases in the future.

Finally, it is the systematisation of law which involves teleological structures. Up to now there are at least three methodological instruments to build legal systems. First are legal norms which can be arranged into a hierarchy. Second are legal terms which describe a dimension of a legal system in modally indifferent legal taxonomies. Third are the patterns of thinking of legal institutions, especially performance and service in return, which can contribute to internal building of the system of law. Further we consider the forth instrument in legal systematic – teleological structures.

8   External and Internal Teleology of the Norm

We can distinguish *external teleology* and *internal teleology* of the norm. The *external teleology G* is defined to satisfy *norm(A) te→ G*. For example, *A = open_door* and *G = fresh_air*, or *A = close_door* and *G = security*.

The *internal teleology G* is defined to appear within the statement (text) of a norm. Formally, it satisfies *norm(A te→ G)*. For example, "Open the door for fresh air".

This internal teleology is of a special interest when an action is open (denoted *X*) and only the goal *G* is given. Formally, it is denoted *norm(X te→ G)*.

If the content of the norm is considered a classical dual structure of the norm is obtained: *condition* and *action*. We add the third element – *finality*. Thus we assume that a norm consists of three elements – condition, action and finality:

$$norm(\textbf{if } condition\ A \textbf{ then } should\ be\ behaviour\ or\ action\ B\ \ te→ G)\ . \qquad (4)$$

Here we note that Luhmann [17] differs between conditional programming (*conditional Programmierung*) and finality programming (*Finalprogrammierung*).

Also teleology can be in the condition: *norm(*if *A te→ Goal* then *action)*. Consequently, the variations of teleology within the content of the norm may be present in each of the three elements of the norm.

Thus we focus on two kinds of notation. First, a domain "symbolisation" like *te→*; it is easier. Second, a correct logical formalisation. They are distinguished: *norm(A te→ G) ≠ N te→ G*, where *N* stands for a norm. Here the left hand side says that the norm itself is the statement containing the goal *G*. The right hand side says that the norm *N* needs a statement, i.e. *te-statement(N te→ G)*, to make *G* explicit.

9   Case-Based Reasoning Versus Statute-Based Reasoning

In legal theory there are several mainstreams which bring about specific results. These mainstreams are not opposites but emphasize different positions of the same system. This is true for CBR and SBR: *case-based reasoning ≠ statute-based reasoning*. However, there is no contradiction in this formula, but different aspects of reasoning are revealed. CBR and SBR deal with different dimensions of legal reasoning.

The argumentative acts of parties are covered by facts and norms which are relevant to assess the facts. "Attack v. defence" involves not only facts, but also rules, e.g., *Attack* "*r1, r2, r3, fact1, fact2*" *v. defendant* "*no r1, but r7*".

Legal arguments are based not solely on the decisions of cases, but also on the legislation of general rules. We can even say that a trend rises to automate the production of individual legal norms so that the argumentation steps back. If the process is ruled by forms the parties fill in the forms and no additional argumentation takes place. Therefore it is possible that in future the legal argumentation in routine cases will step back because of massive computer applications.

Respectively, in the future legislative workflow and argumentation in frame of legislation will gain more interest. This is true for both the professional argumentation of disputing parties and also the argumentation of citizens in e-participation. The arguments will be confronted in synopsis. Therefore it is interesting to evaluate the arguments and to represent them in the system of content.

We believe that a two-state status of an argument is not enough to accept it. This corresponds to practical needs where different forms of asserting, disputing, supporting, etc. in explicit modes of argumentation are considered. There are different statuses of qualifications of elements within a case, not only two, e.g., *Case "r1 attacked-defended, r2 con, fact1 attacked-defended, fact2 con"*. Facts can be confirmed by testimonies, proved (official version of a decision), etc.

From the point of view of the teleological method different forms of argumentation are interesting in both the decisions of individual cases and in the legislative workflow of production of general norms. Not only norms but also the arguments concerning the norms may be the subject of goal analysis. In legislation the goal-based argumentation is more frequent than in decisions of individual cases.

10   Legal Speech Act Versus Legal Content Versus Container of Legal Documentation

We think that three layers are important in teleological analysis. First is a concept of "speech act" in general and "legal act" specifically. The law is a legal act, so is a decision. While writing about legal acts, Kelsen [13] says that "Is" is transformed trough the interpretation to "Ought". Legal hierarchy consists of such legal acts. They have their external teleology and also goals for which they have been created.

The second concept is "legal content", i.e. the content of legal texts. The language structure of a text does not depend on what legal act it appears in. If a draft is created by a ministry and presented for examination the draft has a particular text. Let us assume that the text is presented unchanged to the government and the government formally passes it as a governmental bill. And finally the parliament passes the unchanged text as a statute. Then the text is the same but three different legal acts are presented. The concept of legal content refers to this text. From the teleological point of view, the same formulation of the text is handled and different teleological structures may be derived from it.

The third concept is "container of legal documentation". The later consists neither of statutes nor paragraphs, but of a variety of other documents. These documents consist mostly of a text as the content of the container and thereupon metadata. The teleological structures come up to the legal documentation from different places; similarly they come up to the metadata of the container.

Legal taxonomies and legal ontologies emerged in connection with legal informatics. They serve to produce the containers of legal documentation better and contribute to more efficient search. Here *ex ante* and *ex post* views are distinguished. This is also true for the definition of teleological elements.

The presented concept of the analysis of teleological structures in law emerged from the field of legal informatics and not from the dogmatics of interpretation of legal acts and their content. We defend a methodological approach which rests on the following statement. Formal analysis of teleological structures in law is feasible on condition that we find structures in the text which lead – as a bridge – to formalisation. Such intermediate structures require creating a notation. In fact, the aim of the paper is to draw reader's attention to an intermediate method that underlies a strictly formal treatment.

11 Conclusions

We aim to contribute to theoretical foundations. Without the progress in theory there is no progress in practice. The proposed notation $A\ te{\rightarrow} B$ leads to a theory of relations in law. Different types of the teleological relation $te{\rightarrow}$ can be distinguished. The teleology concerns the whole legal architecture. Apart from norms, concepts and institutions the teleology offers independent base for system development in law. The intermediate notation for teleological structures in law can be viewed as a contribution to formal methods of knowledge representation in legal informatics.

The practical expectations are to supplement legislative drafting with teleological statements. Thus the transparency of e-government can be increased.

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Driver or Passenger? An Analysis of Citizen-Driven eGovernment

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Abstract. eGovernment is often put forward as a transformation supporting empowerment and democracy, building on principles such as 'citizen-driven' and 'citizen-centered' development. In addition it is often symbolized by a technology-laden and romantic progressivism. In this article this picture is analyzed from the perspective of the ones supposed to put eGovernment into practice. A model to analyze our relation with technology laden governmental development is put forward. The results, resting on a large scale empirical study in a local municipality, show that a remarkably high number of civic servants (acting in their role as citizens) did not see any possibility to change the transformation if they thought it not to serve the citizens. Implying that there is still a long way to go to live up to such beautiful proclamations, and also highlights the question whether 'citizen-driven eGovernment' is an accurate framing?

Keywords: citizen-driven eGovernment, relationistic perspective, accountability.

1 Introduction

Intimately connected to the idea of eGovernment are principles such as citizen-driven and citizen-centered transformation, both in research articles and governmental and supragovernmental policies [1]. And there are several voices raised, pointing at the need for strengthening the citizen perspective in eGovernment development projects [2] [3] [4] [5]. Furthermore, the expectations on what increasing use of information technology in governments will provide are vast and varies greatly. Even in eGovernment research a naïve optimism and technological determinism is frequently to be found [6] [7] [8] [9].

When often presented with the combination of these two images (citizen-driven and naïve technological optimism) it is easy to get the impression that there is nothing to fear and everything to gain in an accelerating transformation of government towards eGovernment. And the outspoken image of citizen-driven transformation would consequently put all citizens in the driver seat.

This article will however turn this image upside down. Notable, not by simply presenting a contradictory image of a government-driven, top down, pessimistic vision of future eGovernment (which is nevertheless interesting) but by analyzing the picture from within (or below, depending on choice of epistemological perspective) i.e. from

the view-point of the civic servants on an administrative level. They are the ones who, in different ways and on different stages, provide eGovernment services and put eGovernment into practice which makes them an interesting group to ask. And the question throughout this article is; - do civic servants perceive the eGovernment trans-formation process as citizens driven?

By starting out from a relationistic perspective, resting on J Israel [10] and Simmel [11], what is put forward as rewarding is the analysis of our relation with technology-laden development. This relation is described as dialectical and as such dynamic[1] and possible to connect to several other features such as the concept of subject positions (dominant and subordinate) by Andrew Feenberg [12]. The concept of subject posi-tions is added to provide variables to describe this relation from a power perspective. Last, the notion of active or passive action strategies [13] is attached to be able to depict the possible ways to act each relation implies.

The combination of the above, the theoretical model 'Relation with Technology-model' [14], is then used in a large scale empirical study to analyze the notion of citizen-driven and technology optimistic eGovernment transformation. And the aim is two-folded, examining the notion of citizen-driven eGovernment transformation from the view-point of the ones expected to put it into practice and also questioning whether 'citizen-drive eGovernment transformation' is a desirable framing and if there are alternatives.

2   Relation with Technology Laden Transformation

When analyzing citizen-driven eGovernment transformation what is often put forward are concepts following on the tradition of user-participation, participatory design (PD) and user-centered systems design (UCSD) where it is claimed that technological de-velopment will gain from user participation in the development process since they (the users) are intimately connected to the knowledge about the situation where the technological solution actually should provide added value [15][16][17][18]. How-ever, in practice, user-participation in eGovernment is often done by having user representatives in the information systems development project teams [19] or is con-fused with usability-tests where users are expected to respond to existing proposals (on different stages in the development process). The 'from within perspective' where users are given the possibility to identify and formulate the problem themselves are still quite unusual [2] [5].

In this article the notion of citizen-driven eGovernment transformation is analyzed from the view-point of the ones expected to put it into practice. Not on a managerial level but on the administrative and service-providing level. It would of course also be interesting to ask the municipal citizens but at this stage of the research (which is a part of a larger study where the managerial level is already covered) the focus is on how the ones supposed to deliver eGovernment views the notion of citizen-driven eGovernment.

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[1] The relationistic perspective rests on social constructivism (Berger & Luckman 1987) and is as such also related to the concept of 'co-construction' (see Oudshoorn & Pinch 2003, Rose, D. & Blume, S. 2003).

And the research question is if they would describe it as if the citizens are in the driver's seat or not? And if they would describe it as if the citizens could change the direction if they thought it necessary? To be able to address these questions the relationistic power dimension are more closely emphasized.

2.1 A Relationistic Perspective

What is argued for here is the *relationistic* perspective put forward by Joachim Israel [10] in Handling och samspel.

> "The relationistic basis […] emphasise the processes that take place between individuals, between them and their surrounding and the social situation in which they happen" [10 p.76].

According to Israel what is happening *between* is everything and the 'individual' almost does not exist since we cannot share an understanding about it. So, while trying to understand a phenomenon or a course of events the crucial perspective is the relationistic one.

The relationistic and inter-subjective focus is also closely linked to what Hirschheim & Klein [20] labels *the therapeutic purpose* or the communicative function of IS. Which attempts to "contribute to the achievement of mutual understandings or at least compromises between different agents through negotiated arrangements: "…other agents are not treated as inanimate objects of opponents, but as fellow human beings and partners" (ibid. pp. 242-243). In addition, Hirschheim & Klein suggest that an important focus is that "all IS researchers need a better understanding of their clients' 'lifeworld' and existential concerns" (ibid. pp. 243).

2.2 Subject Positioning, a Way of Describing Different Relations

How then could we describe the different relations? Andrew Feenberg [12] introduces the thought that there exist dominant and subordinate technological actors i.e. different *subject positions*. Meaning in technology is as such extrinsic if we are talking about the dominant technological actors, since they are the constructors and producers of technology. But to subordinate actors meaning in technology is intrinsic, "for the most part they merely carry out the plans of others or inhabit technologically constructed spaces and environments" (ibid. preface: x). Hence, there is little or almost nothing, subordinate actors could do about technological designs and therefore "their relation to technology is thus far more complex than that of dominant actors" (ibid. page xi).

Feenberg claims that we ascribe different meanings to technology according to our positions, subordinate or dominant. The producers, or technological masters, are dominant actors both in the way they view technology and the way they act when encountering technology. Their view of technology is based on a rational, instrumental and efficiency oriented system and they hold the necessary professions to form the technological spaces in such a way. Opposite to these dominant actors are the subordinate actors who "encounter technology as a dimension of their life-world…and…merely carry out the plans of other or inhabit technologically constructed spaces and environments. As subordinate actors, they strive to appropriate the technologies with which

they are involved and adapt them to the meanings that illuminate their lives. Their relation to technology is thus far more complex than that of dominant actors" (ibid. 1999: preface: x).

The two positions, subordinate and dominant, will in this context however refer to intersubjective (social psychological), rather than macro and societal, conditions. It does not focus on describing (and by doing so reconstructing) what kind of position an individual/ subject has, using classical sociological variables such as class, gender and age (even though these are of course important) but it rather places its emphasize on intersubjective processes. However, and somewhat simplified, the way "subject positioning" will be used here is; linguistically different since it is in progressive form (–ing form) which implies an ongoing process (in opposition to the static form of "position"). The argument is that since it is constantly changing and ongoing, i.e. dialectical, it implies a dynamic dimension to the reality constructing process.

2.3 Action Strategies, a Way of Describing Different Ways of Acting due to Relations

Even though Husserl's phenomenology could hardly be labeled an action theory the results phenomenology could present (i.e. someone's conceptions about something) is highly practical due to the fact that "our conceptualizations about the future are in most cases an exhortation to us to act in the present" [13, p.51]. Bjurwill uses the phenomenon "future" as an example and connects it to the concepts "actuality" (what exists in this moment) and "potentiality" (what could exist in the future) (ibid. 1995:50-51) and by doing so, touches upon the more philosophical and ethical discussion about values about how the future *could be* constructed and *should be* constructed (ibid. 1995:51). When addressing these questions (actuality, potentiality, could, should) Bjurwill claims that it is unavoidable not to link theory to practice, since "the conceptions we create about something inevitably will effect our actions towards it" (ibid. 1995:51). So, the line of thought leads us to: our plans and thoughts about what *will* happen, *what could and could not be done* affect the way we act[2].

The conceptualizations and actions could then also be characterized by activity or passivity. We could believe in progress, *tendency*, independently to whether or not we actively interfere, *influence*. The separation between tendency and influence illustrates the possibility that we could hold a negative view about the future (in this case the view about technology and technological development) but nevertheless act actively. Or, the other way around, we could hold a positive view of the future (technology/technological development) but act in a passive manner. These two more modulated types of relations complemented the more obvious ones: that a positive view would result in active actions or a negative view would result in passive actions.

2.4 Point of Reference

So when are our different relations with technology born and, when and how are they further developed? To start off with trying to analyze the point of reference (PoR) i.e. what kind of subject, or in this case object (technology laden transformation), the

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[2] This is especially present in Heidegger [21] and his comments on "varat och tiden", where our conceptualizations about time, in this case about the future, will affect our way of being.

relation is referring to enlighten the process. *Point of reference* then symbolizes the need for the user to have a point of reference to be able to describe his or her relation with technology laden development. The reference point also serves as a distinction between general/primary and specific/secondary relations with technology laden transformation[3]. By using the concept pairs 'general-primary' and 'specific-secondary' we can separate (and make distinct) between different points of references which is important to classify and sometimes grade between different descriptions about relation with technology laden transformation.

2.5 A Model to Describe Citizens' Relation with Technology Laden Transformation

The combination of subject positioning, action strategy and point of reference then illustrates and formulates a possibility to describe the relation with technology laden transformation. The combination provides a possibility to describe ones relation as subordinate or dominant and whether one would describe the transformation as a subject to alterations. The argument here is that as long as we are unaware of our relation with technology laden transformation we could hardly, at least not with any precision, make decisions as the result of conscious thoughts (resting on Ellul 1964). We need mental pictures that could help us see and acknowledge our relation. And as such the model could be used to mutually understand each other and it could also inspire us into having further discussions.

The model could be illustrated as below:
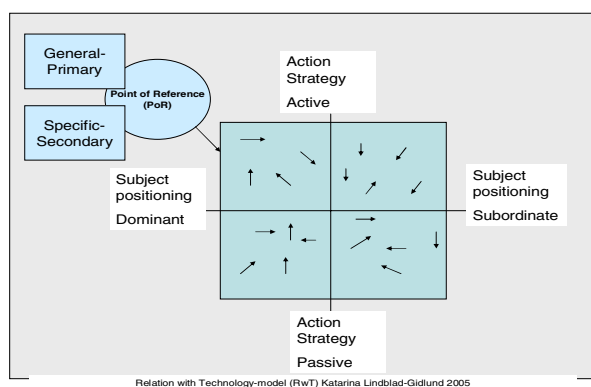
Fig. 1. The Relation with Technology-model by Lindblad-Gidlund 2005

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[3] The use of 'primary' and 'secondary' are also connected to the socialization process with primary and secondary socialization (for original thoughts on the socialization process see Mead 1934) since it, in the same way as in the socialization process, contains an earlier and deeper embedded relation with technology (general-primary) and a later and under constant progress relation with technology (specific-secondary).

In the model, *point of reference* symbolizes the need to have a point of reference to be able to describe his or her relation with technology laden transformation. In this context, eGovernment, depending on how the question is formulated (specific expressions of eGovernment solutions or vague overarching picture of the transformation as a whole), could be both general and specific. The general/primary apprehension is seldom a particularly elaborated or analyzed thought and it often refers to a general perception about the concept. Specific/secondary point of reference on the other hand is more elaborated. The two dimensions *subject positioning* (dominant-subordinate) and *action strategies* (active-passive) then illustrate different ways of describing ones relation with eGovernment.

3 Method

By choosing the RwT-model as an analysis strategy several next steps are implied, but it is still possible to perform both a qualitative and quantitative study. In this case a quantitative and large scale study was chosen to be able to analyze civic servants' view on the relation between citizens and eGovernment transformation. The model has been tested earlier in qualitative studies in the development of increasing use of information technology in a school context before [14] so statistical material were appealing.

The respondents are employees in a local municipality (medium-sized with 95 000 inhabitants) on the verge of eGovernment transformation. The empirical analysis presented in this paper is therefore based on a survey to the whole body of employees in the municipal administration (2624 employees). To manage such a large quantity a web inquiry tool (eval) was used and to be able to distribute the inquiry to the total mailing list of all employed at the municipal administration we were given certain prerequisites. One of them was that the inquiry was not supposed to take more than approximately five minutes to answer. This of course influenced the possibilities to ask and formulate the questions. It should also be noted that in this specific municipality the concept 24hour government was the most frequently used term in different policy documents that inclined us to choose to use that term instead of eGovernment.

The structure of the inquiry relies heavily upon the RwT-model and the focus here is on the general level, i.e. the overarching idea of eGovernment transformation. The three questions concern (i) the primary aim related to the idea and (ii) the problem identifier and finally (iii) how the idea is perceived, subordinate or dominant, in combination if it is subject to alterations or not. Each question had four fixed answer alternatives.

On the first question, primarily aim for transformation, the respondents were asked to relate the idea of transformation to *efficiency*, *democracy* (transparency, participation), *service* or *other*. Those three alternatives were chosen since they are the prevailing incentives put forward as reasons for eGovernment transformation. On the second question, problem identifier, the respondents were asked to reflect upon whether it primarily was the *politicians/managers*, *administration*, *citizens* or *others* who had identified a need for eGovernment transformation. The politicians are an important actor due to the Swedish duality system but it is also important to get an impression whether the employees felt that the transformation were something they themselves had been a part of formulating.

From the total of 2624 employees it was a response rate of 48,4%, that is 1270 answers from within two weeks (with a reminder after one week). Some of the non-response (1354) were 'automatic reply' (stating holidays, maternity leave, sick-listings etc.) and some also contacted us and said that they could not answer the inquiry sine they did not know what "24hour municipality" meant (any explanation to the term 24hour municipality were intentionally left out since as non effected responses as possible were wanted and also the thought that such reactions could be the result existed, and such a result is an interesting result in itself).

4   Results

As the table shows, according to the civic servants in the municipal administration, the predominant aim of 24hour government transformation is that it should increase the municipality's service (quicker and better services). Increase transparency and participation only received 4,8 % response rate which is interesting for a transformation with a citizen-driven image. However, it is important to note that the formulation of the question is delimiting and highly constructed. Of course, it is not possible to totally separate between the three strategies, they are linked to each other and intertwined to a large extent. The aim of the question is rather to investigate what kind of picture the respondents do perceive as most prominent.

And since as many as 90,7 % gave the answer that increasing service were the primarily aim, the answers to question number two became even more interesting; who did they think identified the need for such an increase in the municipality's service.

The response to the second question, whether the idea of a 24hour municipality holds solutions to problems primarily identified by politics, administration or citizens (or other), did not show a similar domination as in question number one. But as many as 47,5 % saw the municipal citizens as primary identifier of the need for increased service (se table 2 below). If the 'problem' were lack of service it was the citizens that suffered most from it.

Table 1. In many situations it is often talked about a 24hour government and there exist expectations that the municipality of XX should strive in such a direction. According to you, do these thoughts primarily aim at:

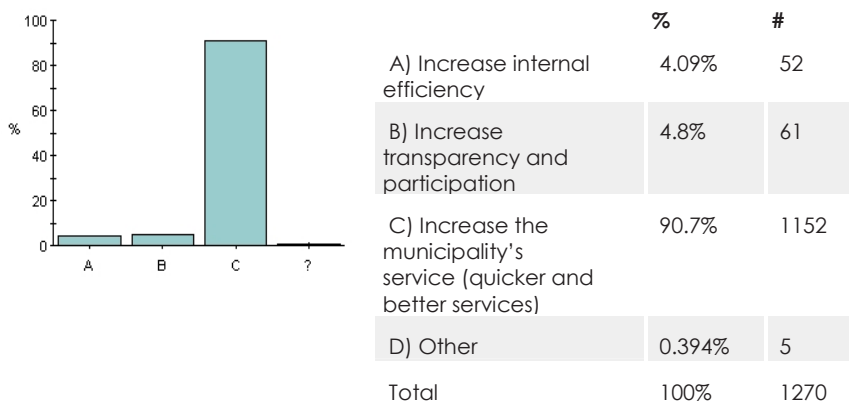|	%	#
A) Increase internal efficiency	4.09%	52
B) Increase transparency and participation	4.8%	61
C) Increase the municipality's service (quicker and better services)	90.7%	1152
D) Other	0.394%	5
Total	100%	1270

Table 2. Do you think that the idea of an 24hour municipality holds solutions to problems primarily identified by:

	%	#
A) Politics	30.8%	391
B) Administration	21%	267
C) Citizens	47.5%	603
D) Other	0.709%	9
Total	100%	1270
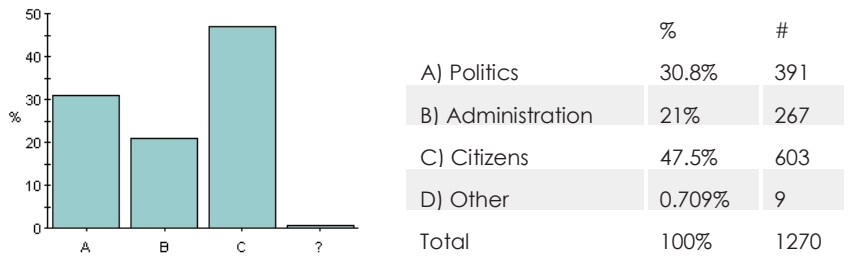
The third question were a combination of two dimensions; (i) whether they thought that the transformation should serve the citizens *or* if the citizens should adjust to the transformation and (ii) whether they thought that if it did not serve the citizens they could do something about *or* not. The response shows that the major part (50,1%) of the respondents thought that the idea of 24hour government should serve the citizens (i.e. the citizens were dominant), it was not the transformation itself that was important for any reason (such as image or ratings) and if it did not serve the citizens, the citizens could do something about it and create a change (dominant/active relation).

On the other hand, as many as 36, 2% (the combination of 27,7% and 8,5% and the relations dominant/passive and subordinate/passive) did not see that citizens had any possibility to change the transformation if they thought it not to serve them, which is quite remarkable in what is put forward as a citizen-driven transformation (se figure 3 below). And in addition the last relation (subordinate/active) could be questioned as well, even though these respondents would describe citizens relation with the
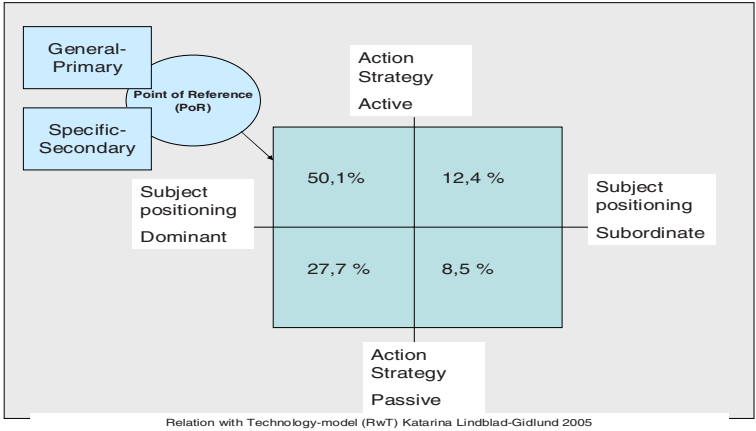

Relation with Technology-model (RwT) Katarina Lindblad-Gidlund 2005

Fig. 2. Relation with Technology-model (RwT) Katarina Lindblad-Gidlund 2005

transformation as active i.e. they could do something about it if it did not serve them they would describe the transformation as something the citizens actually adjusts to (implying maybe that even though citizens could act, they do not do so for various reasons worth looking in to).

These results are quite attention-grabbing related to how eGovernment transformation is launched. It does not support the image of a citizen-driven transformation and additionally it stresses the argument that democratic processes appears to be subordinate to demands for efficiency and service in eGovernment transformation.

5   Who Is Driving What?

The results in this study challenge the picture of a citizen-driven eGovernment transformation in the municipality at stake. It also touches upon the objectives present in eGovernment transformation; enhanced democracy and service.

The empirical results of this study show that the image of a citizen-driven eGovernment transformation is complex (and maybe not as obvious as policy-makers would like to believe). But after depicting that citizen-driven processes are complicated and not that easy to accomplish, one could be tempted to ask why that is the case? Is it because it is really complicated to accomplish citizen-driven eGovernment transformation and we have not yet found suitable methods (i.e. large-scale user participation methods) or, is it because there is something inherently challenging in the image which we are overlooking?

Closely connected to citizen-driven eGovernment transformation is the customer-oriented market logics and several researchers are investigating the relationship between eGovernment and New Public Management (NPM) [22][23][24] and maybe some of the keys for understanding the complexity put forward above lies in such an endeavor. New Public Management stresses the connotation of the citizens as a consumer choosing services [25] and of at first glance such an endeavor could be perceived as promising to enhance democracy and create a citizen-driven development path.

According to Collins & Butler [25] it might be if we could, and would like to, separate between service delivery and democracy since the customer apprehension (directly citizen-driven development) is more suitable in a strictly service delivery perspective while it is troublesome when we expect it to support (and sometimes even replace) democratic processes since it clashes with the system of representative democracy.

And maybe Collins & Butler touches upon a possible answer to the results above? While urgently and persistently trying to transform government into an eGovernment we tend to overlook what we actually are trying to obtain? We are maybe not that sure about 'who is driving what'?

The notion of a citizen-driven eGovernment transformation has such a positive connotation that it almost seems threatening to even try to approach it from a critical standpoint.

Butler & Collins argue that with principles such as rapid response, extension of choice and mass customization, application of market research techniques (which are all relevant principles in marketing models) are threatening democracy since the areas they are applied to are not politically neutral in an eGovernment context. The rapidity "may be the very antithesis of what is required for good democracy…" (ibid. p.56)

since they might too fast translate public opinion into public policy becoming politics resting on populism, and democratic filters are disappearing. Extension of choice and mass customization on the other hand, gives a more individualized but at the same time fragmented society, and by doing so might result in lack of shared experiences since citizens are not exposed to topics they "would not necessarily have chosen themselves" (ibid. p. 58). And by "perceiving citizens as consumers… marketing approaches may regress to the analyses of consumer preferences rather than participation in the public political system" (ibid. 61).

And it is exactly here some troublesome questions arise since a blur between customer-oriented service delivery (which could enhance from directly citizen-driven development i.e. large-scale user participation) and democratic processes threatens representative democracy and the principles of deliberation, informed assent and accountability (ibid.) and maybe that is why citizen-driven processes in technology laden transformation becomes complex?

Maybe, citizen-driven eGovernment transformation really means back to basics where citizens demand thorough anchoring, legitimacy and political accountability.

6   A Missing Driver?

From the argument above it is possible to put forward another concept of driver, a political one. Langdon Winner touched upon a similar discussion when raising the question; - do artifacts have politics? [26]. And when trying to depict the possible difference between public and private sector information management Rocheleau [27] also highlights accountability and political processes and the decision-making process (legislatures, interest groups, public demands channeled through political processes) as one of the important distinctive variables. Jorgensen and Klay [28] go a step further and talk about establishing essential normative principles and responsibility to follow them up. According to Jorgensen and Klay, a possible effect would otherwise be what they call 'moral relativism' where social norms excavate and it becomes hard to hold the ones that actually have made the decisions supporting such a developing process responsible.

In her analysis of the role of political and cultural variables in eGovernment policies Silvia Bolgherini [7] found that eGovernment comes into view as extremely technology based and that it shades the very nature of these policies i.e. to support a well defined political will. According to Bolgherini there is a "sort of technological trap embedding the e-gov policies so that the mainstreaming approach to them does not consider the human factors and, instead concentrate on technical and technological variables as the main determinants of all e-policies" [7:272]. Bolgherini states that eGovernment transformation needs a firm political position to have a chance to be successful and as such "they must be prompted by a political leadership and not by technical experts" [7:272].

In conclusion, perhaps a critical analysis of the notion of a citizen-driven eGovernment transformation gives at hand that, (i) the question what should be driven and then by whom should be asked, and thereafter (ii) if the driver in representative democracy turns out to be the politicians they need to step up and carefully scrutinize their decisions and accept the accountability, responsibility and normative elements that follow and, likewise, the citizens needs to be a more active passenger.

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Improving Trust in Composite eServices Via Run-Time Participants Testing⋆

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Abstract. The Service Oriented Architecture paradigm promises to open and integrate Public Administration offices in order to provide high-value e-services to citizens. Nevertheless to foster real usage of e-services by citizens, in majority still not fully acquainted with Internet technologies, it is necessary to put in place mechanisms to reduce as much as possible perceived system misbehavior. e-Services often handle personal and sensible data, therefore trust on the behavior of the system becomes of primary importance. In this paper, focusing on run-time composition of e-services, we provide an approach that reduces the possibility that the system will fail as consequence of interoperability issues among run-time discovered services, and after that sensible data have been provided by the citizen. The approach uses run-time testing to assess interoperability between services, and model-checking based techniques to reduce the number of test-cases to be applied. An exemplificative case-study is also illustrated and discussed.

1 Introduction

Interoperability and cooperation among Public Administrations (PAs) are nowadays fundamental aspects to promote the governance. e-Government [1] plays a basic role for a better delivery of government services to citizens, business and organizations, and for a more efficient management of the governance. For this reason public administrations promote e-services to automate their activities, to improve their cooperation and to provide faster and more efficient access to services. In this context the Service Oriented Architecture (SOA) is tailored for cooperation among different PAs covering different roles in administrative procedures. Practical benefits of SOA are today increasingly recognized permitting to improve business agility and to provide high quality services through the use of web service technology.

A web service (WS) can provide a real implementation of the e-Service concept. Technically a web service [2] is a piece of software available over the Internet that uses a standardized XML messaging system to interact with other WSs and general clients. Web services technologies solve low level interoperability issues through the use of open and standard XML-based formats (e.g. WSDL [6]) and protocols (e.g. SOAP [6]). Over such low level standards other application level standards have been defined allowing to describe the integration and cooperation of several services in order to fulfill a particular task. This is the case of standards for defining service orchestrations (e.g. WS-BPEL [4]), in which service compositions are defined assuming the availability of a central coordinator, or choreographies (e.g. [14]), in which such an assumption is not taken and services are integrated in a fully peer-to-peer fashion.

Application level standards seems particularly appealing for adoption within the e-government domain. In many cases full provisioning of e-government services could require and be represented through the integration and cooperation of services externally exposed by different PAs. In a near future a change of residence could be requested to the PA accessing to an orchestrated e-service which interacts with services provided by the different municipalities involved in the process. This would permit to a citizen to change her/his residence without the necessity of physically going to the various PAs offices.

Certainly in the described scenario, and in most scenarios involving PAs, many issues related to security, authentication, authorization, confidentiality and privacy of the process, and of the handled data, cannot be ignored. Indeed many standards are starting to emerge trying to provide an answer to such important issues (e.g. WS-Security [13]). Nevertheless the situation become even worse if we admit that services can discover each other at run-time, starting only then to interact. In such a setting many issues related to application level interoperability and integration emerge. Let's consider again the case of the change of residence. The services deployed by the two municipalities could be involved in the first mutual interaction of their existence. Wrong assumptions on data formats or application level protocols could lead to dangerous behavior and unpredictable results. In such a setting our work suggests the usage of run-time testing on discovered services in order to check service behaviour before real-usage. As consequence the interaction will start only if no mismatches are discovered and aborted otherwise. As better illustrated in the following of the paper the approach could also help to increase trust on service usage from citizens. The approach poses clear requests to run-time platforms and assumes the possibility of making testing invocations on running services. This behavior can certainly have dangerous consequences on running services that have to be take into account. Nevetheless these are quite general consequences of any run-time testing approach so they are not discussed any further here for reason of space.

In the next sections we detail the proposed testing approach and the hypothesis for its applicability. Next section discusses dynamic service composition and its influences on trustworthiness of services. Section 3 provide some technical background for the following material, and Section 4 details the various assumptions

and phases of the approach. Successively in Section 5 we show how the approach can be applied on an exemplificative scenario. Finally we discuss in Section 6 some related works and we draw some conclusions and opportunity for future work in Section 7.

2   Dynamic Service Composition and Trustworthiness in the e-Government Domain

PA procedures to satisfy citizens needs can be quite complex. Full accomplishment of Citizen Directed Services (CDS), i.e. services that are explicitly defined to be directly used by the citizens, requires, in the general case, the execution and coordination of many different related tasks, often to be performed by various offices, possibly belonging to many different PA organizations. The involvement of different PA organizations has important consequences on the total time required to complete the provisioning of a single CDS. It is not difficult to identify PA services that last several days before being completed. Even worse there are cases, in particular in those countries in which PA organizations are rather loosely integrated, in which part of the coordination has to be directly carried on by the citizen, which has to visit different PA offices to collect, carry on, and return documents; in practice the citizen has to fix the inefficiencies in PAs integration and organization putting in place the needed coordination. This situation did not change much even with the advent and introduction of ICT within the PA sector. Indeed the integration of heterogeneous ICT infrastructures has been a really complex and general issue on the table for a long time, which, when feasible, often asks for extremely expensive solutions.

The Service Oriented Architecture (SOA) paradigm promises to revolutionize the world in ICT infrastructures integration. Thanks to the service abstraction concept and the adoption of open standards, different organizations can easily be integrated, starting to be interoperable without the necessity of sharing their internal business rules or data structures. Correspondingly a revolution can be easily foreseen in the provisioning of PA services to citizens. According to the new paradigm each PA will be abstracted as a set of provided services externally accessible, and implemented using one of the available technologies enabling the SOA vision; being Web Services (WS), and related technologies, certainly the most prominent choice at the moment.

Adopting the service oriented approach the real implementation of a CDS is derived through the integration and interaction of services externally exposed by each single involved PA. The integration and coordination of the different PA organizations is not anymore on the shoulders of the citizen. In this new scenario the citizen that needs a service can directly go to the offices of the specific PA responsible for providing the service, or can even simply connect to the PA related web site. No knowledge of "PA to PA" interactions is anymore required or will be evident to the citizen. The whole process is made real through the interaction of services exposed by the various PA organizations, with clear benefits also for what concerns total execution time.

CDS are typically implemented through the definition of so called orchestration. An orchestration describes, from the point of view of the orchestrator (director), how a set of participating services should be coordinated. Often the binding of a real service instance to a participant is defined at run-time depending on data provided to the orchestrator. For instance in a change of residence the town of provenance, and so the corresponding e-service, cannot be defined in advance.

In order to make run-time composition and interoperability easier, at least at the syntactic level, standard interfaces will emerge also in the PA sector. Definition of standard interfaces has also positive consequences on the market of services. Different developer can decide to provide implementation for defined services still having the possibility to interact at least at the syntactic level. On the other side run-time composition has important consequences on semantical interoperability increasing the risk of failure for a running orchestration.

Run-time misbehavior of service orchestrations can have subtle consequences in preventing real usage of e-government services. This is related to the important concept of user (citizen) perceived trust, which results strongly affected when the process handles sensible data in a perceived incorrect way. Particularly dangerous are those failures that manifest themselves after that sensible data have been provided. This is clearly the case for interoperability failures when run-time discovery and binding is permitted. Interoperability failure scenarios lead to frustrating sensations by the citizen that does not understand if her/his data have been modified or not. Even though a good infrastructure usually prevents from reaching inconsistent states, in which for instance the citizen looses the previous residence and does not acquire the new one, it is certainly probable that the citizen will not use the electronic service again.

Our proposal here, as described in detail in the next sections, is to introduce a short interaction trial for dynamically discovered services involved in a orchestration scenario, and before any request for sensible data to the citizen. During the trial a number of tests will be executed on the dynamically bound services in order to assess their behavior in the specific scenario. Therefore in case the trial ends with success the orchestration process will continue requesting to the citizen for relevant information. Instead if the trial ends in a negative way the orchestration ends, returning a message to the citizen saying that due to technical problems the service is currently not available. For sure the user will not be happy with this but its perceived trust will not be so much affected since no sensible data have been provided.

3 Technical Background

3.1 SOA, Web Services and Composition

Service oriented architecture is a computing paradigm and architectural style that leverage on the concept of service. In this vision services are software components that can be used through the net and composed to allow different applications to exchange data and participate in business processes.

The SOA paradigm can be implemented using different technologies among which the Web Service "technology suite" is certainly the most mature one. In particular in a WS setting services are described and published using the Web Service Description Language (WSDL [6]) and they exchange messages formatted according to the Service Object Access Protocol (SOAP) [6] specification. For service publication and discovery a registry is used. Typically in a WS setting the registry is an implementation of the Universal Discovery Description and Integration (UDDI [6]) registry specification.

Above such basic layer, focusing on individual description of service characteristics, various standards have been defined to describe service compositions. Among these standards the Web Service - Business Process Execution Language (WS-BPEL) is certainly the most mature and supported one.

Using WS-BPEL several services can be coordinated by a business process. This process controls service execution providing programming constructs such as sequence, parallelism, loops, conditional and case statements. A WS-BPEL orchestration introduces roles to be played by the services involved in the conversation. This can be done using *PartnerLink* definitions which show the WSDL ports provided by each service in order to exchange messages with other services. Messages are handled by three basic activities: *invoke*, *reply* and *receive*. These respectively correspond to the action of sending and receiving a message in a request-response scenario, the action of sending a response message, and the action of receiving a request message.

3.2   Model Checking

Model checking [7] is a very effective technique to deal with formal analysis and verification of complex software system specifications. A model checker is able, given an operational model of the system and a property that states specific requirements on the same model, to show if the property actually holds or not. Moreover in case the property is not satisfied the model checker points to a counterexample that shows a precise model execution that violates the property.

Since its first inception many tools have been proposed and developed, nevertheless all of them share the same principle. In particular the system is represented by an operational model defining a system state space and the transitions among such states. The property instead is generally specified through a logical formula such as a Linear Temporal Logic (LTL) formula ([8]). Given the model and the formula the model-checker exhaustively explores all the possible system successive configurations looking for possible violations of the formula. When a violation is detected the model checker reports to the user the sequence of decisions and actions that it took, during the exploration, to reach the falsifying configuration.

Model checking has been demonstrated to be a really powerful approach to verify system properties, nevertheless it generally suffers from the well known state-explosion problem, i.e. the number of possibly different system configurations can become too big to permit a complete state exploration. To overcome this problem many heuristics have been defined in some cases resulting in

almost-precise approaches. The state-explosion problem is particularly relevant when the model is augmented, as it is for the case considered in this paper, with data ranging over wide domains such as for instance integer.

3.3   Genetic Algorithms

Genetic algorithms [11] are a technique that mimics natural-evolution processes to find approximate or exact solutions in search problems with large solution spaces, and that are not amenable to exhaustive search. The technique borrows concepts from evolutionary biology like inheritance, mutation, selection, and re-combination to evolve candidate solutions, represented by a set of chromosomes, toward an acceptable solution for the problem.

A generic genetic algorithm requires the definition of a representation both of the solution in terms of chromosomes and of a function (fitness function) to be used to compare the evolving solutions. A fitness function is the objective to reach for a right solution. Therefore, a major issue with this kind of algorithms is the design of the structure of the solution and of the method for its evaluation using the fitness function as the objective. Other parameter that may have critical importance are the size of the population, the type of recombination, and the mutation rate.

Like other Artificial Intelligence techniques, these kind of algorithms can be applied to many software engineering fields. Their application as search strategy heuristics for model checking allows the exploration of large state spaces [10] starting from candidate solutions found by the algorithm. Application in software testing instead concerns data generation. In designing test cases is desirable to find test inputs and test oracles to verify correct behavior of programs. Find test data may be a time consuming task for developer or an hard task if we deal with large domains. Numerous attempts try to overcome these drawbacks automating the generation of these kind of data.

4   The Approach

Run-time discovery and binding is certainly a useful and required characteristic of PAs integration through orchestration definitions. Nevertheless its usage can drastically affect interoperability and countermeasures have to be considered in order to reduce the risk of run-time failures due to interoperability factors. The approach we propose suggests the usage of testing to reduce the risks that a failure is discovered during the processing of a client request, and after she/he has provided sensible data to the service.

Applying our approach in order to derive a test suite for possibly discovered services, the orchestration developer has to put in place various steps. Some of these steps can be quite complex and time consuming. Nevertheless they have to be executed once and for all before the final deployment of the orchestration. Such complexity is justified since it is important to reduce as much as possible the number of test cases to be executed at run-time. Certainly this contrasts

with the idea that bigger test suites provide a more comprehensive verification. Indeed the effectiveness of the approach strongly depends from the definition of a good test case selection criteria focusing on interoperability issues. In the following subsection we discuss the different steps composing the approach thus to provide answers to the these issues.

4.1   Defining BPEL Orchestration for Run-Time Testing

The approach we propose has important consequences on the structure of the orchestration specifications, that the developer has to take into account. In particular in order to carry on a testing trial on run-time discovered services, before that sensible data are provided by the citizen, it is necessary to organize information requests, within the orchestration, in a two steps procedure. In the first step the orchestration only asks for information enabling the discovery and identification of the services to be involved in the interaction. Then all the discovered services will be submitted to a trial according to the defined test suites. In case no interoperability issues are highlighted the orchestration asks for sensible data to the citizen. Instead, in case some interoperability threats are identified, the orchestration replies to the citizen saying that the service is currently not available- at this point no sensible data was provided.

Considering for instance the change of residence example, this would mean that the orchestration has to be organized in order to firstly ask for the coming residence but not for name and other personal information. Having this information it is possible to identify the service that will participate in the orchestration i.e. the municipality to be contacted. Successively personal information will be asked in the second phase and only if the testing trial ends with a success.

In our research we have investigated many citizen directed services and for all of them it seems possible to split the information request in a two phase procedure according to our requirement. Nevertheless in case this would not be possible the orchestration could be organized in more than two steps asking in each step the less information as possible.

4.2   Model Checking BPEL Specifications

Our approach applies a counterexample-based technique that starting from a model and a property is able to derive a test case from a counterexample for that property. A counterexample provides a trace of events for which the property does not hold. Therefore, if we declare that the property $\neg P$ should hold for the system model, the technique generates, in case it exists, a trace for which P holds.

A BPEL flow is typically data-driven. This can be a big problem for a model-checking technique since it can easily lead to a state-explosion situation. To solve this problem some approaches remove data from the model and then choose non determinism to handle conditional choices within the orchestration (i.e. they randomly select a branch of a conditional statement). In our work we use a data generation technique to generate sets of data to drive the model checking phase. In this manner we simulate correct interactions between the orchestrator and the

external services, given the selected data. To generate the needed sets of data we apply genetic algorithm approaches as detailed in Section 4.3.

Test-cases are derived from counter-example generated by the model-checker when reachability properties are specified. In this way we can highlight all the possible paths that can bring from the start of the BPEL process to any possible final state. The derived paths include the interaction actions among the orchestrator and the composed services. For such steps also data are defined according to those provided by the applied genetic algorithm.

In our work we use the model checker BOGOR [16] that is an extensible model checking framework designed to support general purpose and domain-specific (via customization) model checking.

Finally to translate a BPEL orchestration in a format accepted by BOGOR we use BPEL2BIR [5]. BPEL2BIR is a tool that can translate a BPEL specification into a BIR model in order to apply model checking techniques. We have extended this tool to allow the generation of data-driven counter-example suitable for our purposes.

4.3   Test Data Generation

Test data used to drive the state space exploration are generated using a biologically inspired tecnique implemented as a genetic algorithm. The fitness funtion is used to compare different test suites and is tailored on the concept of interaction adequacy criteria and interaction coverage. We define such concept exploiting classical definitions of branch testing, and path testing [15].

Interaction adequacy criteria. Let T be a test suite for a BPEL process P. T satisfies the interaction adequacy criterion for P iff, for each interaction I of P, there exists at least one test case in T that causes execution of I (Where a interaction represents a message exchange between the orchestrator and a composite service).

Interaction coverage. The interaction coverage $C_{Interaction}$ of T for P is the fraction of interaction of process P executed by at least one test case in T.

$$C_{Interaction} = \frac{\text{number of executed interactions}}{\text{number of interactions}}$$

T fully satisfies the interaction coverage adequacy criterion if $C_{Interaction} = 1$

A solution that covers the greatest number of interactions in the process has the highest fitness function value. Interactions are counted with their occurrences. So in case the BPEL Process presents loops it is necessary to define limit to the number of execution.

Our approach aims to merge the space exploration task with data generation features. This is possible if the model used for the state space generation is expressive enough to support an exploration driven by data. Indeed this is the case of BPEL processes.

Data generation terminates when generated data covers a specific amount of interaction in the model, also respecting eventually reachability properties

expressed on the model iself. With respect to other approaches in this manner we can derive from the model checker traces input data (and oracle if the model fully specify participant's behaviour) observing interactions among the various participants.

4.4   Test Suite Generation

The combined use of model-checking and genetic algorithms techniques permit to derive a set of traces that are characterized by an high coverage of the interaction actions among the BPEL process and the composed services, as discussed in the previous sections.

Given a selected trace in order to derive test cases for the different services involved we project the trace, as in Figure 1, with its relative data, over the various participants. In this way we can isolate behavior snippets that can be used for test purpose. Successively we combine all this pieces in a sequence of invocations for a specific orchestration participant. The fact that the traces were derived and evaluated taking into account the number of enclosed interaction actions guarantees that selected test cases are certainly relevant for what concerns the detection of interoperability threats.

(a)   (b)   (c)   (d)
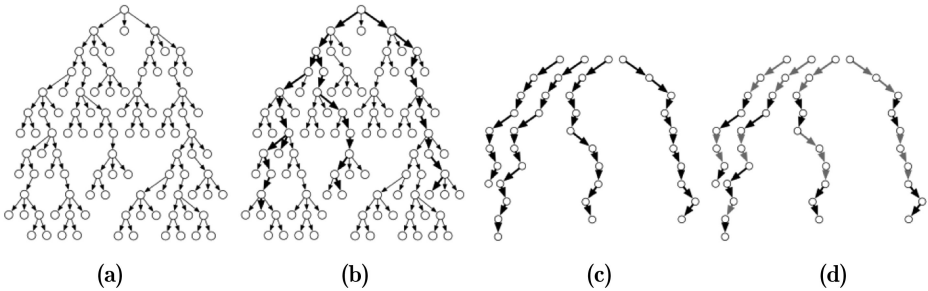
Fig. 1. (a) Unfolding of the system traces, (b) Example of traces selected by the property verification with specific data, (c) Some traces isolated from the tree, (d) Trace snippets for a participant (the gray arrows are interactions with the context)

5   Exemplifying Scenario

In this section we introduce a simplified example in the e-government field to better explain our approach. We consider a composite service that represents the back-end of an on-line payment of fines for traffic violations.

The system allows the user to list traffic violations inflicted by a given municipality. The user is able to pay a fine on-line (interacting with a payment service) or off-line (via bank transfer). The modality chosen for the payment modifies the behavior of the process affecting the methods that must be invoked to notify the payment to the municipality. We want to test this service using an adequate test suite that is expressive enough to cover all possible interactions. For simplicity and to explain our approach we refer to a single test suite for

a service, but the aim is to produce test suites for all the services involved in the composition. The system for managing traffic violations is composed by an orchestration of four different services:

- *Fiscal Code*: given user data returns the user Italian fiscal code (similar to US SSN) that is used as unique identifier for the user and the municipality code used to identify an Italian municipality
- *Tickets*: A service that returns the sanction (here called ticket) for traffic violation within a given municipality
- *CreditCC*: A service that allows the payment via credit card of a ticket
- *CreditBT*: A service that allows the payment via bank transfer

The four services are orchestrated by a BPEL process that handles the interaction between the user and the services as depicted in Figure 2.
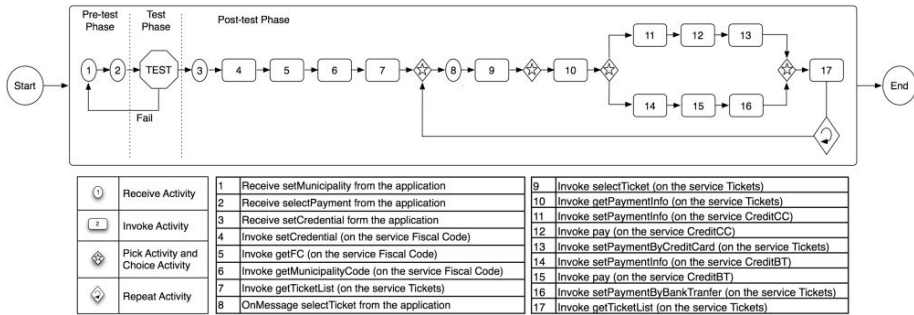
Fig. 2. Sample BPEL Process

The interface exposed by the process include the methods that external applications can invoke to perform payment of fines. A typical scenario foresees the invocation of the method *setCredential* that supply the process with the necessary information about the user, and the invocation of the method *setPayment* to select the modality of payment that will be used in the following interactions.

According to our approach the BPEL orchestration will ask, in a first step, for information concerning the municipality (so to identify the Ticket service) and the way of payment (so to identify the payment service). These information permit to the orchestrator to identify all the services that will interact at run time in order to fulfill the fine payment. After the identification the run-time discovered services will be submitted to a testing trial using the corresponding test suite derived applying the approach described in this paper.

So for instance in case the user specify town M and payment via Credit Card issued by bank B, the orchestration will retrieve a reference to service *Ticket* exposed by M and to service *CreditCC* exposed by B and will start the trial using the test suites defined for the two services. Obviously no trial will be conducted on services of type *CreditBT*. It is worth noting that no data directly related to the user have been provided so far.

In case during the trial phase no errors are highlighted, the process continues asking for personal information such as Fiscal Code. Personal data are then provided to the *Fiscal Code* service (which is a statically bound service so no test are executed on it). The returned fiscal code is passed to the *Ticket* service of the municipality M and a possible list of fines are reported. The used select the fine she/he wants to pay and credit card detail are then requested and passed to the *Credit* service provide by B.

On the other side if the trial discover a problem the process terminates saying that the service is temporarily unavailable. At this point failure details will be logged and reported to the technical teams for further investigation.

6   Related Works

Direct interferences of interoperability issues on service trustworthiness has been explicitly reported in [18]. Our approach combines various techniques in order to apply run-time testing for services to be composed in BPEL processes. To the best of our knowledge there are no directly related approaches in literature, and for which we could provide a comparison. Nevertheless we derived our idea from many different sources.

In particular derivation of test cases from counter-examples has been proposed by [3], [12]. A discussion on model-checking and genetic algorithms can be find in [10]. Finally use of Model-checking techniques for the analysis and verification of BPEL orchestrations has been proposed in [9], [17].

7   Conclusions and Future Work

Citizen trust is a major requirement for real take-off of e-government procedures. SOA promises to revolutionize the way in which e-services will be provided to citizens permitting to easily integrate different PA organizations in a dynamic and transparent way. Nevertheless dynamic discovery of services can increase the risk of failure of composite services with strong consequences on citizen trust. In this paper we propose an approach to reduce the risk or run-time failure due to interoperability issues and after that sensible data have been provided by the citizen. Doing so consequences of failures on citizen trust should be much less impacting. The approach we propose is based on derivation of test cases from BPEL specification applying Model-Checking and Genetic Algorithm techniques in order to have small but powerful test-suites.

The framework have been experimented with some exemplifying scenarios, providing comforting results. In the future we intend to continue the experimentation, also in order to compare the suggested test-case derivation techniques with other Model based approaches discussed in the literature. Also the real impact on consequences of citized trust need to be empirically evaluated.

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Test Strategies for Evaluation of
Semantic eGovernment Applications

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Abstract. In this paper we present a framework for identifying the test focus and test objectives based on the assumption that automatic information processing based on encoded meaning is the core of semantic e-government applications to be evaluated. Taking into account test strategies from software engineering and IT project management as well as different stakeholder perspectives, we identify possible test instruments. Several of these instruments have been applied in the Access-eGov project and we discuss the experience gathered in view of the newly developed framework in order to identify lessons learnt as well as to point to future research. The contribution of the paper is a portfolio of test strategies suggesting certain instruments to be applied from a systems view, agent view, and user view. We conclude that improving semantic e-government applications could be supported through applying a test-first approach, e.g. through providing an e-government test agent to be used in test labs or within the development process.

Keywords: semantic e-government application, test instruments, semantic interoperability, agent-based testing.

1   Introduction: "You Can Only Improve What You Can Test…"

The vision of the "Semantic Web" has received considerable attention also in the area of e-government: semantic interoperability is on the agenda of interoperability frameworks, and the use of semantic technology (which "encodes meanings separately from data and content files, and separately from application code"; Wikipedia) is expected to enhance the integration and quality of e-government services. In this context, we consider e-government applications as *semantic* applications if the computer-based provision of administrative information and services depends on explicit modeling of semantic concepts and the strategic use of semantic technology.

Meanwhile, a number of (research) projects have induced prototypes and pilot applications that can be classified as semantic applications in the above sense (cf. e.g. Abecker et al. 2006). However, applying as well as testing semantic technology and solutions in the area of public administration remains quite a challenge (cf. Wang et al. 2007). The question for designers and investors is: when can information sharing between semantic applications be considered to be successful or not?

The driving force behind developing semantic e-government applications is the expected added value through enhanced semantic interoperability which means that the

"precise meaning of exchanged information is understandable by any other application that was not initially developed for this purpose" (European Communities, 2004, p.16). Here, "understandable" does not necessarily refer to machine intelligence but to the ability to combine received information with other information resources and to process it in a way that the meaning it has for the service users (citizens, businesses, even other administrations) and/or for the service providers is sustained. However, the exchange of information implied by semantic interoperability spans much more than just technical components working together effectively without prior communication. In many cases, the result of one semantic application is an informational resource for another, and the information exchange mostly appears to be unidirectional, deferrable, and/or very loosely coupled. Furthermore, the information is intended to be shared within an open world with distributed applications, multiple stakeholders (providing and consuming information), heterogeneous data, diverse ownerships and a never ending stream of new information being added.

Certainly, only that can be improved for which we have definite objectives *and* a method how to measure to what extent we have reached our goals. However, in open information sharing environments as described above (of which the Semantic Web is the most prominent instance) existing approaches focusing on information sharing success are not sufficient because there is no closed system and we cannot even assume a coherent social context as a source of reliable semantic integrity constraints (in contrast to e.g. assuring semantic integrity of a corporate ERP system). Therefore, this paper concentrates on testing strategies that have the potential to systematically guide development efforts towards improving semantic e-government applications aiming at successful information sharing. The underlying research question is: what are test objectives and test instruments which may inform stakeholders effectively about progress in developing semantic e-government applications?

The research presented in this paper is induced by the need for systematic testing within the Access-eGov research project (see access-egov.org). However, the approach to answer the above research question goes beyond this specific project: we develop a framework for identifying test focus and test objectives based on the assumption that automatic information processing based on encoded meaning is the core of semantic e-government applications to be evaluated. Taking into account test strategies from software engineering and IT project management as well as different stakeholder perspectives, we identify possible test approaches. Several of these approaches have been applied in the Access-eGov project and we discuss the experience gathered in view of the newly developed framework in order to identify lessons learnt as well as to point to future research.

The contribution of the paper is a portfolio of strategies testing specifically the value added by semantic technology. Based on the distinction of systems view, agent view, and user view, we conclude that in order to improve semantic e-government applications the evaluation should be carried out from all three of these views and we suggest certain test instruments for each view. Since there are hardly any instruments for testing if the data and its encoded meaning in focus are successfully processed by other applications (agent view) we suggest future research to focus on applying a test-first approach, e.g. through programming a test agent upfront, in order to improve the technical design and implementation as well as the overall performance in terms of semantic information processing.

The structure of the paper follows the research approach as outlined above: in the next section we develop a framework to identify test focus and test objectives through following up the automatic information processing based on encoded meaning. The third section reviews the state of the art of testing in application development as far as relevant for identifying test objectives and appropriate test instruments. The forth section reports on test approaches and lessons learnt within the Access-eGov project. The final section summarizes the findings through relating the strengths of various test instruments to the three different views and proposes future research.

2   Automatic Information Processing Based on Encoded Meaning

Within this article, we consider e-government applications from the point of view of information management and information processing: We seek to trace how—on top of providing existing e-government information and services—new semantic technology contributes to combining received information with other information resources and to processing it in a way that the meaning it has for the application users (information providers and consumers) is sustained. To this end, we develop a framework to identify (a) steps and functional components of automatic information processing based on encoded meaning, and (b) test objectives as well as suitable points of process interception for test purposes.

Ad (a): for identifying steps and functional components we take advantage of semantic technology enabling data involved in every process step to be automatically linked to the relevant context of its interpretation. Hence, in a semantic e-government application we can *observe*, i.e. test, the following by viewing the application from inside and/or taking the view of a user or machine agent interacting with the application:

1. *System view:* Information is being processed from sources to targets while in every major process step the data in focus is successfully linked to the encoded meaning of the data, i.e. to relevant interpretation context.
2. *Agent view:* The "precise meaning of exchanged information is understandable by any other application that was not initially developed for this purpose" (EC 2004, p.16); prerequisite for this is the provision of formats for integration and combination of data drawn from diverse sources as well as a language for recording how the data relates to real world objects (cf. www.w3.org/2001/sw/).
3. *User view:* The targeted information consumers find the data provided by the application valuable according to their own interpretation context and/or accept the interpretation context intended to be shared by the information sources (administrations, for most parts). According to their roles as application users (e.g. citizen, business representative, administrative employee), they usually have different intentions and ways of interpreting the same data or so-called boundary objects (Klischewski & Ukena 2008).

The idea of an information process and the basic functional components enabling a semantic e-government application are depicted in figure 1. It shows the two groups of users involved in information sharing: The information providers to the left and the information consumers to the right. The information providers create service description and ontologies (used for describing services), thus encoding the information in
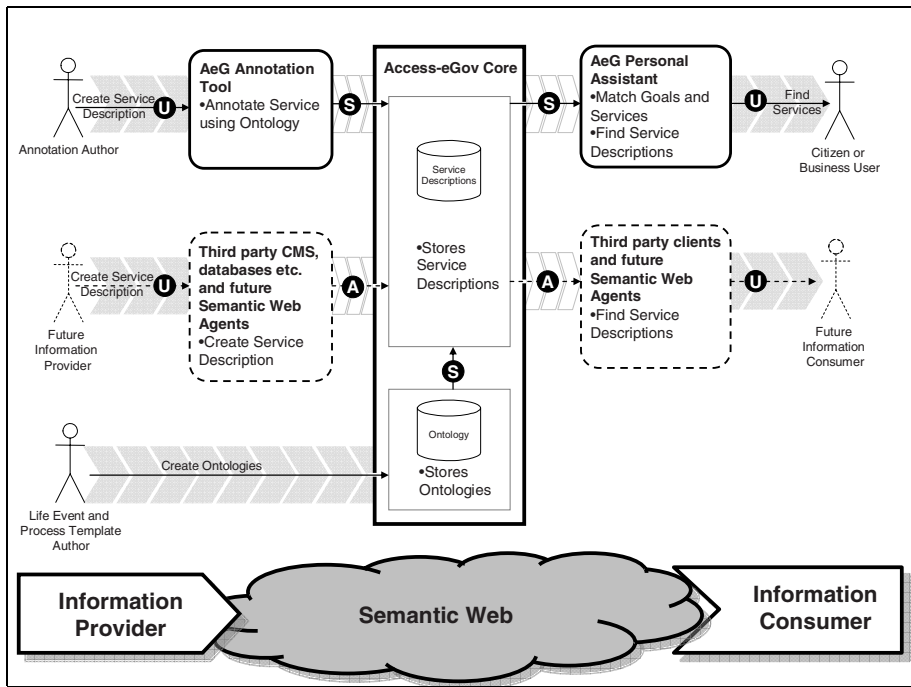
Fig. 1. Information flows from information providers (left) through a semantic infrastructure (middle) to information consumers (right)

such a way that the information's context is formalized. This enables Semantic Web applications, like the Access-eGov Core, to process the information, thus making it available to information consumers. The information consumers try to contextualize the information with whatever formalized context may be made available to them through the user interface. Information providers may either use the Annotation Tool provided by Access-eGov (top left corner) or they may use third party CMS's, databases or software agents (middle left) that are adopted to provide information to the Access-eGov core in different ways (e.g. a web-service API or by semantically annotated content). Information consumers can use the Access-eGov Personal Assistant (top right) to find services. In the future they may also use other clients or Semantic Web agents developed by third parties (middle right).

Ad (b): in order to observe if the data in focus is successfully linked to its relevant interpretation context, we seek to identify specific test objectives as well as suitable points of process interception for the purpose of testing. In figure 1 candidate interception points for testing are marked with a circled "S", "A" and "U". The above framework alerts us to three basic types of tests questions:

1. Is the data in focus successfully linked to its relevant interpretation context *represented within the machine environment*? (Interception points marked "S")
2. Is the data and its encoded meaning in focus successfully processed ("understood") *by another application, i.e. agent*? (Interception points marked "A")

3. Is the data in focus successfully linked to its relevant interpretation context *by the application user*? (Interception points marked "U")

All three of these types of interceptions require different approaches to actually test if the objectives of the semantic application are met.

3   Test Approaches in Application Development

This section reviews the state of the art of testing in systems development as far as is relevant for identifying test objectives and appropriate test instruments.

Test instruments are commonly characterized along two dimensions: (1) being either static (i.e. tests that do not require the code to be executed) or dynamic (i.e. tests that require code execution), or (2) with respect to the level of knowledge that is necessary to design the test for a given system, i.e. black box testing (requiring no knowledge of system internals), grey box testing (requiring some knowledge of system internals), or white box testing (requiring full knowledge of system internals). Different quality attributes and structural levels may be tested by using different kinds of tests. While there is no one-to-one relation between test objectives and test instruments, some instruments are better suited than others for testing certain qualities or levels.

Software testing may be defined as "[…] a process used for revealing defects in software, and for establishing that the software has attained a specified degree of quality with respect to selected attributes." (Burnstein 2003, p. 7) This broad definition illustrates the dual nature of testing, i.e. testing to discover defects and deviations from the requirements (verification) and testing to evaluate quality attributes like usability and reliability (validation). Common quality attributes are correctness with respect to given specification; reliability with respect to required functions under specified conditions; usability with respect to efficiency of use, learnability etc., and interoperability, i.e. the ability of systems and/or components to exchange data with each other (cf. Burnstein 2003). These objectives can be related to the views defined in the previous section.

Systems view: For trivial applications systems, testing may be possible for the system as a whole. For more complex systems it is common practice to divide the testing effort into different levels which correspond to the structural levels of the software:

- Unit testing, which aims at testing individual parts of a software, like single methods of a class
- Integration testing, which tests several components at the same time
- System testing, which tests the system as a whole (acceptance testing also falls into this category)

Depending on the software development methodology that is used, testing may be viewed as a one-time effort or a continuous process during the life-cycle of the software. For example, in the classic Waterfall model of software development, the testing phase directly follows the coding phase and precedes the operation phase (cf. Royce 1970). With the advent of iterative development methodologies testing becomes a continuous effort throughout the development process (cf. e.g. the Testing

Maturity Model in Burnstein 2003) or even the driving force of the software design as in Test-Driven-Development (e.g. Beck 2002).

Besides distinguishing testing approaches by their temporal appearance in the development cycle, testing may also be categorized by the test objectives, the tested object or level, and the test instrument.

With the advent of agile software development methods that require short iterations and continuous integration, tests became more and more important. Tests do no longer only serve as means of validation and verification but can be an integral part of the development cycle to support the re-factoring of code by ensuring that the re-factored code passes all available tests. "Test-first" approaches suggest starting the implementation of a piece of software by first implementing tests for each of the required functionalities. Advocates of test-driven-development suggest that the main driving force of the software design should come from these tests.

Agent view: For testing semantic applications from the point of view of its expected unique contribution (i.e. whether the data and its encoded meaning in focus is successfully processed ("understood") by another application—see section 2) no systematic approaches have been published yet. Extant literature or other sources that could be related to "semantic (application) testing" focus mainly on testing ontologies and/or automatic reasoning using ontologies. Examples of the latter are the provision of Web Ontology Language test cases (www.w3.org/TR/owl-test/) or discussion of complexity in subsumption of clauses in the language of first order logic (Marcin-kowski et al. 2005). With the aim of eventually providing a test bed, Aleman-Meza et al. (2004) have proposed an ontology (SWETO) that incorporates instances extracted from heterogeneous sources for testing purposes.

The capabilities of information processing can be partly tested by so-called "competency questions" which have been suggested and used to guide the development of ontologies as well as to test ontologies (e.g. Gruninger and Fox 1994, Staab et al. 2001). Competency questions are first informally stated in order to guide the design of an ontology. A competency question usually poses a simple or complex question that the future ontology should be able "to answer". At a later stage, the competency questions are often formalized to serve as automated tests for the ontology. However, despite much attention on Semantic Web applications, systematic testing from an agent perspective is still a field waiting for much research to be done.

User view: Different stakeholders usually have different objectives with respect to the purpose of the system under development. This results in different objectives with respect to testing the application in focus. In addition to application users we find "non-users" such as application sponsors, information managers and system developers, each with another distinct view on the information processing in focus. For example, on the one hand the head of administration (a sponsor) might aim for savings and improvements resulting from efficiency gains and increased interoperability, while trying to keep the required effort to reach these benefits as low as possible. Thus, she will want to evaluate the system in this regard. On the other hand, developers may want to test in such a way as to guide the enhancement of semantic structures that fulfil the requirements of their customers. In particular, they want to know how to identify the relevant concepts in the domain of interest, how to limit the scope of this analysis effort, and how to get all relevant information they need for implementation.

Within the testing framework (cf. figure 1) we focus on those stakeholders who participate in the transfer of information, i.e. who will genuinely use the system either as information providers or as information consumers. Possible test instruments are:

- think aloud sessions: a user is asked to perform a certain task with the help of the newly developed system (or system under development). The user is instructed to "think aloud", i.e. to say out loud what is going on in her mind while using the system. The whole session is usually video-taped for later analysis by an expert. (Cf. Joergensen 1989)
- workshop: several users are asked to use the system, discuss their experience and provide feedback for improvement
- questionnaire: a questionnaire with closed questions that assess information quality and usability aspects of an application from the user's point of view using answers on a predefined scale allows comparison of results across different regions and pilots (cf. Elling et al 2007)

4   Testing Semantic Information Processing in Practice: Experience from a Field Test

This section reports on test approaches, experience, and lessons learnt within the Access-eGov project. The trial in Schleswig-Holstein involved several administrations in different municipalities and communities whose officers had to annotate a number of services related to marriage. The officers used a software component called Annotation Tool (AT) to create these service annotations. Prospective users of the marriage-related services (i.e. citizens) were asked to use another software component, the Personal Assistant Client (PAC), to look up relevant service information.

The project's evaluation strategy was first outlined in project deliverable D2.2 "User requirement analysis & development/test recommendations"[1] and defined in D8.1 "User requirement analysis & development/test recommendations". The main focus of the evaluation strategy lay on the information quality criteria from the information consumer's point of view as it is described by Lillrank (2003). These information quality criteria were the basis for most testing efforts of the first trial. In addition, systems developers introduced their own criteria for testing.

Developer testing: The developers relied on component testing and integration testing using the well known JUnit-framework. The component tests were developed as *ex post* white box tests, i.e. the tests were developed after the components which were to be tested. Most tests were written for complex components, which usually comprise several classes. Integration testing focused on core functionalities that are provided by different sets of components. In addition to functional tests, the developers performed performance and scalability testing for the most critical components.

Think-aloud: The think-aloud sessions were conducted with citizens (using the PAC) and an administration officer (using the AT). Video-taped think-aloud sessions yield rich qualitative data that can reveal many problems users may have in using a system. In our case they revealed difficulties that information providers had when creating the

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[1] All public deliverables are available at: http://www.accessegov.org/acegov/web/uk

service description (e.g. missing data fields or insufficient description of the intended content of a field). They also revealed where citizens had problems interpreting the information in the PAC. The four citizens, who participated in one session each, were between 20 and 40 years old with ages roughly evenly distributed across this range. They were recruited among colleagues, friends, and friends of colleagues based on the fact that they either planned to marry in the near future or had married in the recent past. The think-aloud sessions with the citizens were conducted at the premise of the Schleswig-Holstein user partner by one of the user partners. Sessions lasted between 15 and 45 minutes, depending on how thoroughly the citizens decided to read the provided information. All citizens were asked to perform the same tasks related to marriage services in Schleswig-Holstein as they would normally do or had done.

The administration officer was around 40 years of age working part-time as the public relations officer being also responsible for the communal web-site of the community with around 200,000 residents. This think-aloud session was conducted by one of the authors at the officer's office. The officer was asked to annotate different services by using the annotation tool. The session lasted about 45 minutes.

Workshop: One half-day workshops were conducted with the officers responsible for annotating the services. This workshop had two goals: 1) to introduce the officers to the annotation tool prototype and its usage, and 2) to collect feedback on any issues with this prototype. The workshop was video-taped for later analysis.

The 13 participants were either registrars responsible for performing marriage related services and marriages or Internet editors responsible for authoring communal web-sites. During the workshop the officers used the Annotation Tool to describe some of the marriage-related services their administration provides. After a short period of getting acquainted with the system, the officers provided feedback on their experience. One large concern of the officers was that the user interface did not provide sufficient context which in some cases made it difficult for them to know what kind of data should be entered and in what way it should be structured. For example, if one creates a link to another site using the appropriate option in the Annotation Tool, what should one enter in the provided fields labeled "URL", "Name", "Description"? However, while the officers called for "more context", they were still able to describe the services as intended.

Online questionnaire: In order to collect quantitative data that can be compared across regions and trials, we extended an available questionnaire for evaluation of web-sites (Elling et al 2007). Most questions aim at the mentioned information quality and usability criteria and must be answered on a given scale. The questionnaire was distributed as an online-questionnaire. The URL was published through an announcement of the states press office inviting the public to try the Personal Assistant and to answer the questionnaire afterwards. In addition, participating officers were asked to inform citizens about this online service during their regular work activities. The online questionnaire was available for a period of four weeks and was completed 69 times (incomplete submissions: 223).

Lab test: In addition to real-life testing by citizens we also conducted a series of test sessions that took place at a test lab at the German University in Cairo. The lab test was designed to test PAC, i.e. the information consumer perspective. Testers were

recruited among the students and were asked to perform and document a series of tasks. The results were evaluated with regard to completeness and correctness of the retrieved information. The test lab did not perform any technical tests, like load testing. Instead, the tasks were designed a way that the testers could easily identify with it, which was intended to bring the test as close to real-life situations as possible. Each tester had to perform the same series of three different tasks during three test sessions. 14 testers performed a total 42 test tasks over a period of three days. Each task took around 90 minutes to complete (including instructions etc.). One task focused on those aspects of the Personal Assistant Client that deliver non-personalized information. The other two tasks focused on the personalized information.

Lessons learnt: Though the original intention of *think-aloud sessions* is the testing of usability issues, they are also suited to reveal users' problems with respect to information processing, both on the information consumer as well the information provider side. However, think-aloud sessions are resource intensive tools that cannot easily be used on a larger scale. The *workshop* showed that information providers want to know what the information will look like when it is presented to the information consumer. However, it also showed that information provision is possible without this kind of support. This is particularly important because it is counter-productive to any future application if information providers tailor their information too specifically for any particular information consumer agent and/or user interface. The *questionnaires* are well suited to survey a large sample of information consumers and yield comparable results across different regions, but they can only serve as a coarse tool for identifying issues that may—or may not—be caused by missing contextual information. Thus, questionnaires should always be followed up by more thorough investigations with other instruments. Though the questionnaire itself is a coarse tool that does not allow the identification of specific problems, it is helpful to provide an overview of how the system's information quality is perceived by a larger number of users. The information qualities that are rated low can then be investigated in more detail by using more specific instruments that yield richer results. The *lab test* surfaced some bugs in the software and also pointed to some usability issues that later were confirmed by the think-aloud sessions. More importantly, it showed that the majority of the testers were able to successfully complete the given tasks and interpret the information as intended. For example, testers were generally able to find the address of the responsible office for a certain service. This indicates that the Personal Assistant Client provides information in a manner useful for citizens.

All in all, the project's evaluation strategy was quite successful on the third testing question (cf. section 2) but could benefit from some improvements: developers testing should be more aligned with field test instruments in order to integrate the results. In particular, all the employed test instruments in the field test relied on human testers and user-interface testing. Therefore it needs additional instruments testing the information processing focusing on the agent view (thus bypassing the additional impact of the application interfaces on information processing).

5   Discussion: Software Agents for a Test-First Approach?

In this paper we set out to identify suitable test instruments helping to answer the three types of test questions according to the three views introduced in section 2.

Based on our theoretical considerations (section 2 and 3) as well as our practical experience (section 4) we can conclude recommendations for testing semantic applications and point to future research.

As all three views (system, agent, user) are relevant, we recommend that any test strategy for improving semantic e-government applications should implement test instruments for all three of these views. In application development a variety of test instruments are applied, each with different deliverables. Table 1 summarizes our findings pointing mainly to the strengths of each instrument, supported by our experience in the Access-eGov project (the recommendation could be extended to a full SWOT analysis). The check marks ✓ or (✓) in any table cell indicate that this test instrument is considered useful or partly useful to answer test questions in relation to the system, agent, or user view.

Table 1. Test strategy portfolio

Test instrument	System view	Agent view	User view
Developer testing	✓ Timely feedback on system performance	(✓) timely feedback if suitable test agent available	
Test lab	(✓) Independent, but not timely feedback	✓ Variety of test opportunities	(✓) Feedback from controlled but "artificial" environment
Think-aloud			✓ Rich data about information use and system interaction
Workshop			✓ Comprehensive understanding of stakeholder views
Question-naire			✓ Large scale feedback on user satisfaction

According to this table the test lab has the potential to cover testing from all views, at least to some extent. However, instruments for semantic test labs have not yet been developed or proved to be effective means—here we see the most pressing need for future research of testing semantic applications.

In case of the Access-eGov project, the Personal Assistant Client provides additional contextual information that does not originate from a single information provider. Evaluation has shown that information processing is possible using the developed components (Annotation Tool, Personal Assistant Client and Core), but we have not shown that information sharing is indeed possible in conjunction with other agents. To this end, we suggest the use of "test agents", i.e. software agents that can be used to provide information to and/or retrieve information from the semantic application in focus by using common-place means e.g. a Web-service application programming interface. Such test agents should be able to execute different test scenarios, which are designed to resemble real-life use cases from a technical point of view.

For example, in the Access-eGov project, one scenario would deal with providing e-government services descriptions based on external data sources; and another scenario would test if these descriptions can be retrieved and processed correctly when combined with other relevant information.

Taking into account the broad experience of software testing as well as our own project experience, we conclude that improving semantic e-government applications can be effectively supported through applying a test-first approach, e.g. through providing e-government test agents to be used in test labs or directly within the development process. However, more research is needed to identify what kind of scenarios and functionality such test agents exactly should perform in the area of e-government. These scenarios must be defined from the e-government information management perspective: needing a selection of use cases that resemble typical e-government user interaction, and the information processing should make reference to pools of relevant and accessible data (e.g. resources on e-government websites) as well as to agreed standards of information structures (e.g. e-government service directories) and already standardized and encoded meanings (e.g. ontologies).

Such test agents—if they are fairly easy to handle, are able to technically connect and provide a variety of scenarios for execution—can ensure that any semantic application under development could be sufficiently challenged to test whether the data in focus is linked to its context represented, whether it can be "understood" by another application and/or whether application users actually can get the information they are looking for. Furthermore, standardization of an e-government test agent itself has the potential for significantly raising the level of semantic interoperability: if widely applied, such an e-government test agent could ensure that all semantic e-government applications (e.g. within a certain region) will meet the same performance criteria and will be able to automatically connect their information processes. This, indeed, would be a great step forward to implement the vision of Semantic Web for e-government.

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A Modular Reference Architecture Framework for Electronic Cross-Organizational Interoperation

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Abstract. The organization of value creation has changed fundamentally in numerous industries during the last years. Rather than being part of hard-wired value chains, today's companies increasingly establish loosely coupled, adaptive business networks. However, seamless interoperation across corporate boundaries still faces significant managerial as well as technological challenges. In this work, we propose a reference architecture framework for electronic business media that overcome the drawbacks of today's business-to-business (B2B) solutions. Based on the St. Gallen Media Reference Model this reference framework builds on the design principle of modularity which proved critical for the success of numerous "artefacts" in other, more mature industries. On the basis of a case study in the field of public administration in Switzerland, we show its real-world applicability and its improvement potential.

Keywords: Modular Reference Framework, Organizational Innovation, Seamless cross-organizational interoperation, Event-Bus Switzerland.

1 Introduction

Cross-company electronic interoperation is about to gain significant momentum, but still faces both managerial and technical challenges [1, 2, 3, 4]. On a **technological level**, e-business frameworks (e.g., EDI, RosettaNet, UN/CEFACT) as well as architectural styles such as Service-Oriented Architectures (SOAs) and Event-Driven Architectures (EDAs) already have removed some barriers on the path towards cross-organizational interoperability (Figure 1). However, they are frequently merely message-oriented, of limited focus and scope and can be considered "system-centric" (i.e., they do not allow for scalable federated, heterogeneous infrastructures) [5]. A new generation of providers of comprehensive software (e.g., Electronic Data Interchange (EDI) and Managed File Transfer (MFT) solutions) and services (Integration-as-a-Service (IaaS) and B2B project Outsourcing (B2BPO) providers) for multi-enterprise interoperation is now about to emerge. IaaS providers [5, 6] offer hosted multi-tenant environments for functionality such as reliable and secure communication, trading-partner management, technical integration services and application services (Figure 1). However, these products and services still exhibit weaknesses: the focus on automation rather than business innovation as well as an inherent enterprise-rather than multi-enterprise perspective represent two major remaining challenges

Technology		Organization	
E-Business Technologies	**Products & Services (Private & Public Sector)**	**Organization Design**	**Enterprise Architecture Frameworks**
■ E-business „Frameworks": EDI, RoserraNet, UN/CEFACT stack ■ **Architetcural Styles:** Service-oriented Architectures (SOA), Event-driven Architectures (EDA)	■ **Private Sector:** EDI translators, Managed File Transfer solutions, Multienterprise/B2B gateway software, IaaS and B2BPO service providers ■ **Public Sector:** Net-centric Enterprise Services, DVDV, PVP	■ **Organization design methods** advocating for merely functional (Simon, Fayol) or process-oriended (Hammer, Davenport) organization of work ■ First **modular approaches** (Picot, Reichwald, Baldwin, Clark)	■ **Frameworks:** Zachman, DoDAF, TEAF, FEAF, TOGAF, Business Engineering Framework ■ **Reference Models:** FEA RMs, GIG, NCOW RMs

Fig. 1. State-of-the-Art analysis: Technologies and organizational approaches for electronic cross-company interaction

towards business media for efficient and effective cross-organizational interaction [6]. Also, many business-to-business (B2B) communities are still being setup as hard-wired, inflexible and stand-alone island solutions. However, the frustration of organizations in establishing multiple, single-purpose portals and partner communities grows as both the organization and technological implementation are not built to allow for extensibility, decentralized management and efficiency [6].

In the public sector, first infrastructures for the support of cross-organizational interoperation are emerging as well. The Net-Centric Enterprise Services (NCES[1]) provided by the United States Department of Defense, the German Administration Services Directory (DVDV[2]) as well as the Austrian "Portalverbund Protokoll" (PVP[3]) represent infrastructural artefacts which support electronic interaction between organizations. However, these examples have a limited scope and focus as they only allow for basic data exchange functionality in a specific application domain (NCES), an electronic service registry (DVDV) or decentralized application access policy management (PVP). On a **managerial level**, traditional methods for the design of organizations are often merely process-oriented (e.g. the Business Process Redesign approach promoted during the 1990s [7]) or are limited to a solely functional and inflexible view (Figure 1). Only very rarely, approaches can be found which recognize the paramount importance of organizational flexibility through a modular design, particularly in the cross-company realm. Besides of these focused design methods, comprehensive enterprise architecture frameworks exist.: The Zachman Framework [8], the U.S. Department of Defense Architecture Framework (DoDAF), the U.S. Treasury Enterprise Architecture Framework (TEAF), the Federal Enterprise Architecture Framework (FEAF) and The Open Group Enterprise Architecture Framework

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[1] http://www.disa.mil/main/prodsol/cs_nces.html

[2] http://www.bit.bund.de

[3] http://portal.bmi.gv.at/ref/downloads/PVWhitepaper.pdf

(TOGAF) represent essential means for managing intra-enterprise architectures as they structure architectures into domain-specific views and perspectives to reduce inherent complexity. However, they can be considered system-centric since they mainly focus on aspects within the boundaries of an enterprise and thus do not necessarily optimize the design or governance of federated information environments.

In this work, we propose a **modular reference framework for distributed enterprise architectures** which support the organization and implementation of seamless electronic interoperation. Based on the St. Gallen Media Reference Model [9], the framework builds on important design principles which have proven critical for the success of numerous "artefacts" in other, more mature industries [10, 11]. In particular, our reference framework encompasses the principle of modularity to increase efficiency, flexibility, extensibility, to reduce design and management complexity, to account for uncertainty and finally to enable a decentralized and collaborative evolution of business media for electronic, cross-organizational collaboration. The remainder of the paper is organized as follows: In Chapter two, we elaborate on the definition of central terms and present our research methodology. In Chapter three, we propose a novel reference framework for organizing and implementing electronic collaboration across corporate boundaries. On the basis of a case study in the field of public administration in Switzerland, we show its real-world applicability and its improvement potential in the course of Chapter four. In Chapter five, we conclude the work with a brief summary and an outlook on future work.

2 Definition of Terms and Research Methodology

The **service definition** underlying this work is as follows: A service is considered as activity that is performed to create value for its consumer by inducing a change of the consumer himself, his intangible assets or his physical properties [5, 12, 13]. The focus of this study lies on services which are provided and consumed **across corporate boundaries**. For providing and consuming these services at the interface of organizations, media are required: According to Schmid [9], **media** can basically be defined as follows: They are enablers of interaction, i.e. they allow for exchange, particularly the communicative exchange between agents (individuals, organizations or machines can assume the role of such agents). In the course of interaction between agents, objects can be created, modified, deleted or exchanged via the medium. **Architecture** can be defined as "the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution." [14, p.3] IEEE has published a **recommended practice for architectural description** [14] which is supposed to facilitate the expression and communication of architectures through standardization of elements and practices for architectural description. According to this IEEE practice (1471-2000), all *systems* are subject to an *architecture*. To be able to describe these adequately and systematically, there are *architectural descriptions*.

As a central element, *viewpoints* exist: In order to reduce complexity and to maximize the benefit for certain groups of stakeholders, an architectural description selects one or more viewpoints, from which the system is then analyzed. In each view, a set of concepts and interrelations is codified in order to be able to adequately present and

analyze certain *concerns*. A concern expresses a specific interest in some topic pertaining to a particular system under consideration. While such a methodology for architectural description provides common concepts and terms of reference to facilitate the expression and communication of architectures through standardization of elements and practices, an **architectural framework** represents a domain-specific instantiation with defined viewpoints and associated artefacts for their respective modelling. The focus of this work is to provide an enterprise architecture framework which is supposed to act as a reference for application in multiple cases. The concept of **modularity** represents a final term to be defined: Modularity encompasses "an important set of principles in design theory: design rules, independent task blocks, clean interfaces, nested hierarchies, and the separation of hidden and visible information. Taken as a whole, these principles provide the means for human beings to divide up the knowledge and the specific tasks involved in completing a complex design or constructing a complex artifact" [11, p.90]. In short, we refer to modularization as the conscious splitting apart of a design into independent subunits. The **research methodology** applied in this work is as follows: A thorough analysis of the essential principles of modular design and its technical as well as economic impacts has been performed on the basis of case studies in the field of product design as well as in the software programming context. We apply the key principles to the organization and implementation of cross-organizational electronic collaboration, develop a modular enterprise architecture reference framework and analyze its improvement potential.

3   A Modular Reference Architecture Framework

As argued above, media can be considered as enablers of interaction [9, 15] between agents. Such interaction enablers can be structured into three main components: First, an organizational component (O-Component) defines a structural organization of agents, their roles, rules which impact the agents' behaviour as well as the process-oriented organization of agents' interactions. Second, a logical component (L-Component) comprises a common "language", i.e. symbols used for the communication between agents and their semantics. Without such a common understanding, the exchange of data is possible, but not the exchange of knowledge. Third, a physical component (C-Component) supports the actual interaction of physical agents. This component can also be referred to as carrier medium or channel system. Based on these components, the **St. Gallen Media Reference Model (MRM)** [9] has been introduced which comprises four major architectural views (community, process, service and infrastructure) on media and represents the fundament of the framework proposed in this article. The three media components presented above can be assigned to these four views as argued in the following.

In accordance with [9, 14, 15], each of the views thereby addresses specific architectural concerns: The concerns addressed by the **community view** comprise the following: Who are the agents interacting over the electronic business medium? Thus, a registry of the different stakeholders must be available to ensure that organizations can publish their business profiles and are also enabled to find adequate trading partners. Second, what are the participating agents' exact roles and the rights/ obligations associated to the roles? The different agents using the medium are assigned certain
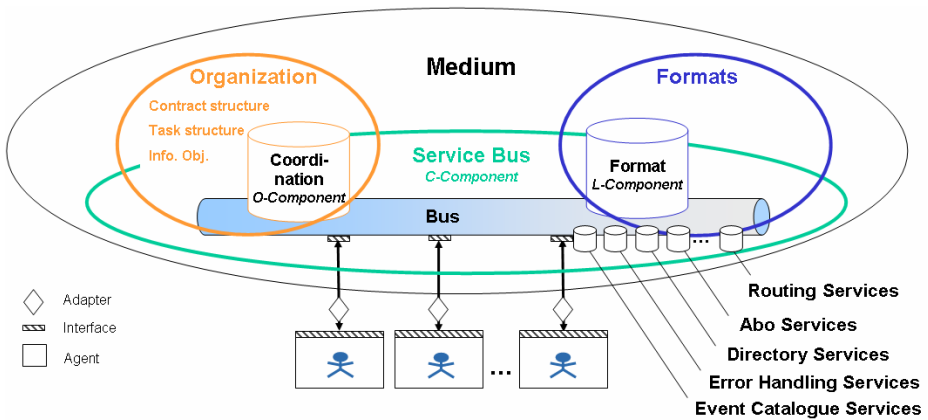
Fig. 2. Architectural Framework for Cross-Organizational Collaboration

roles in order to reduce complexity of community management. Third, which services are provided/ consumed by these roles? Last, which information objects are exchanged between the agents? These concerns can be summarized as structural organization which has been referred to as "contract structure" by Chandler [16].

As a second part of the organizational component, the process-oriented organization is the major concern within the **process view**: how do individual agents behave and how is the overall service choreography defined? The community view and the process view constitute the O-Component (Figure 2). On this organizational level, true modularity is ensured through decomposing the overall collaborative scenario into atomic sub-tasks, assigning these to specific roles and finally structuring them into mutually independent, but seamlessly interoperable "interaction modules". Similar to software modules in the programming context, interaction modules represent self-contained spheres between agents which are not tightly intertwined with each other and can thus easily be organized and as re-organized without affecting other modules (see the case study in Chapter four).

The two major concerns addressed by the **services view** are: Which are the services provided by the electronic medium and which services are required to connect to it? Second, which are the interfaces of these services and how are they described? Within the services view, the actual "operating system" enabling the interaction of agents is specified. Services for message routing, error and exception handling, validation, security, agent directory and event catalogue services represent only some of the services which are required to implement the ideas of the organizational view and to allow for secure and reliable interaction. Besides such operational services, coordination services may be employed to automate certain processes and to react on certain message content according to a pre-determined behaviour. The main two concerns addressed by the **infrastructure view** are: Which technology shall be used to implement the business medium as defined before? Which design principles are to be employed during implementation? Together, the service view and the infrastructure view constitute the C-Component of our architectural framework (Figure 2). On this physical level, modularity is ensured by employing a set of modular services which can be

augmented, split, excluded, substituted or inverted [11] without affecting other ser-
vices within the electronic business medium. To ensure seamless interaction between
agents, all organizational and technical artefacts discussed above need to be subject to
a common semantic understanding. Therefore, a logical component exists which
comprises shared formats (semantic standards for message formats, role models,
process descriptions, service interfaces and others).

Agents are connected via this medium with the intention to interact with each
other. In the language of modular design, both the medium and the agents can be
considered as modules which shall seamlessly work together in a coordinated and
efficient way. In a modular system design, clear **interfaces** are needed as formal trea-
ties between sub-elements and thus also as pre-established ways to resolve potential
conflicts between interacting parts. As a central constituent of our reference architec-
ture framework, interfaces enable seamless interaction by hiding internal design pa-
rameters (hidden information) and only describing information (visible information)
which is required to connect both the organizational and technical components. As
opposed to many existing approaches [6], our framework foresees the consideration
of all the components constituting media as discussed above: interfaces specify the
visible part of an agent's structural and process-oriented organisation (O-Component),
its services and infrastructure (C-Component) as well as semantics (L-Component)
for seamless and comprehensive interaction. It is important to mention that both sin-
gle agents and multi-agent systems (who are internally organized and interact via
another business medium) are enabled to connect to a specific business medium. If
agents do not comply with the design rules employed by the medium, additional
adapter components are required: In case two business ecosystems have already
established specific organizational (O-Component-related), technical (C-Component-
related) as well as semantic (L-Component) standards, they are thus enabled to seam-
lessly interoperate by leveraging an adapter which mediates between them (Figure 2).

4   HERA: Corporate Tax Declarations in Switzerland

In this section we elaborate on a case study that has been conducted in the course of
the Swiss government-funded project HERA [17] which aims at an improvement
of the corporate tax declaration procedure for companies in Switzerland. Mainly four
different roles are involved in the scenario of collaborative tax declaration: *Compa-
nies* intend to finish and submit their tax declaration to the *cantonal tax office*. For
this purpose, they may engage an external *accountant*, who often finishes accounting
documents, creates the actual tax declaration on behalf of the firm and provides
suggestions for optimal profit appropriation. By law, companies are enforced to inter-
operate with *auditors* who examine compliance of the declaration. Today, all organi-
zations involved in this scenario interact via different media, often in paper format or
based on proprietary electronic interfaces (some rely on stovepipe software solutions)
and protocols. Besides technical challenges such as lacking interoperability, the col-
laboration between the stakeholders is managed in an informal fashion, differing from
case to case. Depending on the concerned cantons (their respective legislation varies),
the structure of the business community (an external accountant may or may not be
part of it), several context-dependent parameters, decisions made by agents internally
or work results and individual preferences, the final flow of interaction strongly var-
ies. Based on the reference architecture framework presented above, a highly agile

electronic business medium has been designed to support this cross-organizational tax declaration scenario. The resulting HERA architecture shall be analyzed from both an organizational (community and process views) and a technological (service an infrastructure views) perspective:

Community and Process Views. As a first step in the process of organizing and implementing electronic media-based cross-organizational collaboration, the common task (the actual goal of the interaction) has to be structured (**decomposed**) into **activities** or sub-tasks (which may be encapsulated as services) according to the general design guidelines for modular systems [10, 15, 18]. Rather than simply reflecting the business process, we analyze and structure the collaboration into ("public") services which include, but are not limited to the following: "Send prepared accounting documents", "Send profit appropriation proposal", "Send accounting data/ trigger auditing", "Send posting to accountant", "Send audit report", "Send completeness report", "Request signature" etc. A list of eleven of the identified activities has also been assigned to the x-axis of the matrix depicted in Figure 3.

Secondly, we assign each of the sub-tasks specific **roles** to define the user who are allowed to perform these. In the HERA context, four major roles exist: taxable company, accountant, auditor and governmental tax office. Roles comprise a set of rights and obligations and can be assigned to certain agents. Based on the roles which specific agents connected to the medium assume, they are allowed to perform only subset of the abovementioned activities (an agent who assumes the role of accountant may not perform auditing tasks, for example).

As a third and final step, the diverse sub-tasks shall be decoupled by defining mutually independent, organizational "**interaction modules**" as argued above. In our case, we have identified three generic modules: the first one concerns the specific interactions between companies, accountants and auditors; the second one exclusively comprises the interactions between companies and the cantonal tax offices; the third and final one focuses on the interaction between the governmental tax offices (the activities constituting the third module have not been depicted in Figure 3). Benefits resulting from this task modularization include: first of all, responsibilities for tasks and related information (data access rights) can be clearly separated and limited to those roles which are explicitly involved in a certain module. Secondly, operational agility and manageability can be improved: In case of modifications (e.g., required by legal changes), the modules can be re-organized without affecting other modules.

In order to exactly define these modules we need to examine and model the **process-oriented organization** of interaction in the HERA context. Based on a task structure matrix principle which has been introduced in the field of product manufacturing by Steward [19], all the sub-tasks identified have been assigned to both the x and the y axis of the matrix as depicted. These tasks may be subject to various interdependencies (i.e., task 1 can be a precondition/ input to task 2 as the results accomplished through task 1 constrain/ impact task 2 and thus necessarily needs to be performed prior to task 2). In a task structure matrix, interdependencies are marked as "x". For example, if the results of task 3 constrain activities in task 4 (The activity "Send posting" is only allowed to be performed after the activity "Send accounting data" has been completed, an "x" is entered in line 4 (the line of the impacted task) and column 3 (the column of the constraining task). In this way, all mutual constraints can be defined towards an overall process-oriented organization.
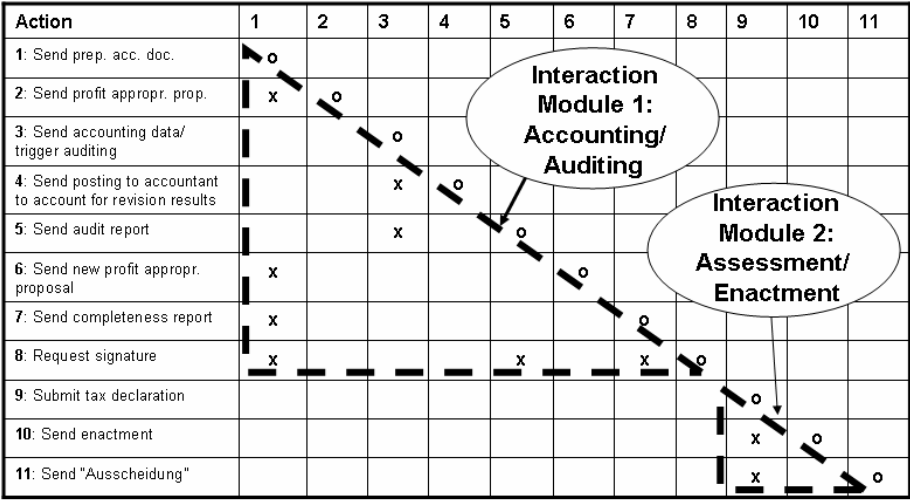
Action	1	2	3	4	5	6	7	8	9	10	11
1: Send prep. acc. doc.	o										
2: Send profit appropr. prop.	x	o									
3: Send accounting data/ trigger auditing				o							
4: Send posting to accountant to account for revision results			x		o						
5: Send audit report			x			o					
6: Send new profit appropr. proposal	x						o				
7: Send completeness report	x							o			
8: Request signature	x				x		x	o			
9: Submit tax declaration									o		
10: Send enactment									x	o	
11: Send "Ausscheidung"									x		o

Fig. 3. Task structure matrix revealing the interaction modules (selection)

The dependencies can be leveraged to exactly define the "interaction modules" described above. Interaction module 1 comprises all the tasks which are conducted by the taxable company, the accountant and the auditor prior to the submission of a tax declaration to the cantonal office. Within this first module, high interdependencies between tasks exist (which does not represent an issue as these design tasks are part of hidden modules and can be specified without affecting parameters of other modules). The second module comprises the tasks which constitute the exclusive interaction between the taxable company and the respective cantonal tax office. These tasks show interdependencies as well. The activity "Send Ausscheidung" must follow the "Send enactment" activity. A third interaction module has been defined (not depicted in Figure 3) which concerns the mere interaction between the cantonal offices (these interact to determine the distribution of tax load on the different cantons the company has premises in). While high interdependencies exist between the tasks which constitute an interaction module, no interdependencies have been identified between tasks which belong to different interaction modules.

Figure 4 illustrates the resulting organization of decentrally operated interaction modules: the **module "governmental interaction"** is instantiated once: it allows cantonal authorities to exclusively exchange data in order to define the share of the tax load as described above. The **assessment/ enactment module** is supposed to be instantiated once per canton to account for their individual needs with respect to data formats, business processes and other organizational artefacts. In other words, each canton may establish an individual assessment/ enactment interaction module which encompasses all the tasks dealing with submitting a tax declaration and the subsequent assessment as well as enactment procedures. Independent from these modules, the **accounting/ auditing interaction modules** can be instantiated. On the basis of the HERA business medium, each company shall be enabled to establish an individual structural and process-oriented organization governing the interaction between itself and external accountants and auditors. The independence of this module can be
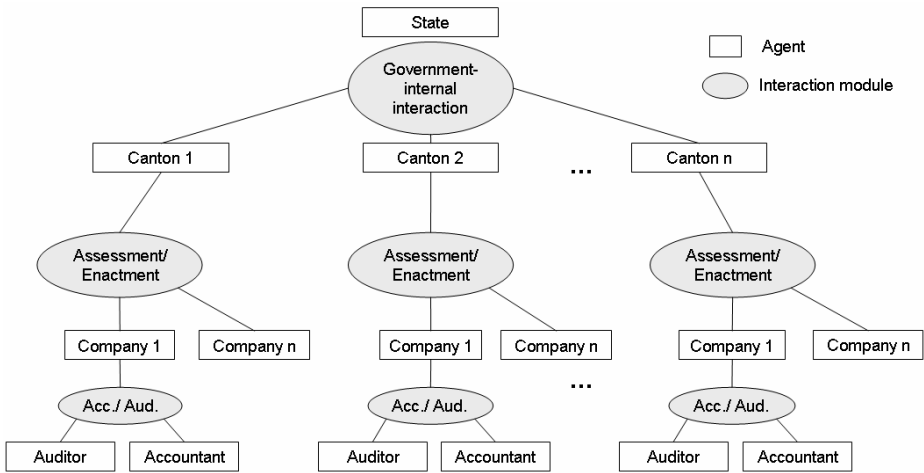
Fig. 4. Modular structural and process-oriented organization in HERA

emphasized with the following example: Companies may submit their tax declaration via the HERA business medium without having used HERA for accounting/ auditing purposes before. The two modules can be considered fully independent and may thus be reorganized autonomously. However, to ensure interoperability and fast exchangeability, all interaction modules follow a set of common design rules and provide clear interfaces to the outside.

To complete the modelling of the O-Component of the HERA architecture, **information objects** need to be specified. To account for the principle of modularity, every interaction module may encompass individual message formats (in the governmental interaction module, other messages need to be specified than in the assessment/ enactment module). In case modules are subject to heterogeneous organizational design rules, **adapter components** ensure the "translation" between agent-internal organization and the shared, "public" structural and process-oriented organization within each of the interaction module instances.

Service and Infrastructure Views. In the HERA context, the Service and Infrastructure Views rely on and extend the recent Swiss governmental initiative "Event Bus Switzerland (EBS)" (Figure 5): In order to physically realize the interaction of agents, a bus medium has been proposed which features a set of operational services [20]: *abonnement services* (supporting Publish/subscribe message dissemination), *directory services* (allowing for publishing and retrieving business partners and their respective profiles), *event catalogue services* (documenting all messages which may be disseminated via the bus including the agent roles which may send/ receive them), *transformation services* (accounting for mediation of electronic artefacts which adhere to different format standards), *security services* (encryption and decryption), *operating services* (for media administration purposes), *error services* (automatic failure detection and removal), *routing services*, and *validation services* (e.g., for evaluation of correctness and integrity of exchanged information).
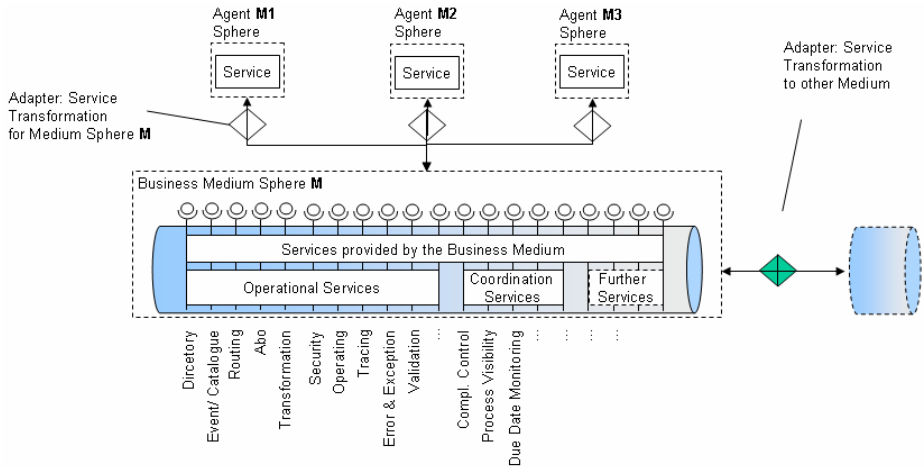
Fig. 5. Modular service bus architecture (service and infrastructure view)
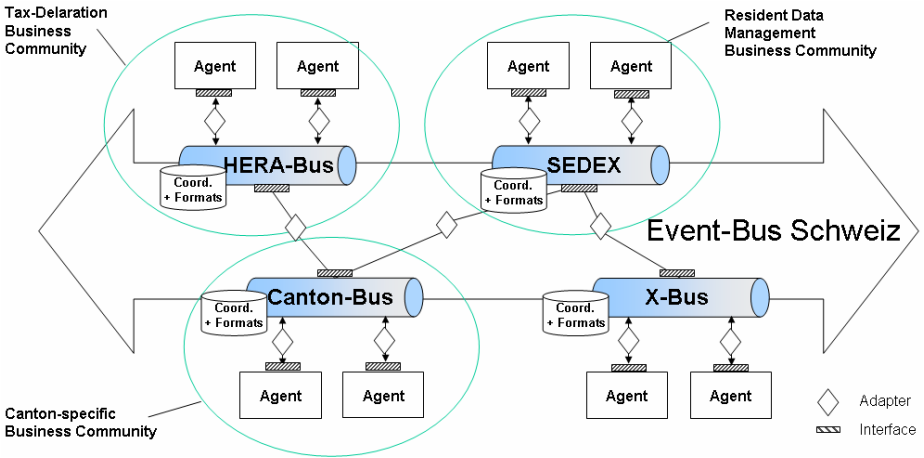
Fig. 6. Interoperability across media through compliance with global design rules

Again, clear interfaces and adapters allow for connecting agents who operate services with other interface standards. Within the modular bus media, additional coordination services (e.g., in the HERA context, completeness control, process visibility and due date monitoring) can be deployed without impacting other buses.

As already indicated in Figure 5, the physical component of our reference architecture framework does not only foresee modularity within the sphere of one "business community" and its business medium, but also allows for loosely coupling several buses which again may connect diverse agents. For cross-medium interoperability, each bus can incorporate an individual service design as long as it adheres to minimal "global design rules" which require the implementation of a standardized directory service, an event-catalogue service and the conformance to a specific message envelope standard [20]. On this basis, events can be seamlessly exchanged between agents

connected to different bus media. Figure 6 shows part of the emerging e-Government landscape in Switzerland which comprises a set of mutually independent, but seamlessly interoperable electronic media. The SEDEX bus, for example, has been designed to serve governmental institutions which perform resident-management specific tasks. Through complying with a set of global design rules (the EBS specification), agents connected to the SEDEX bus can also interoperate and exchange messages with agents connected to our HERA bus.

5 Conclusion

In this work, we analyzed managerial and technical weaknesses of existing approaches to supporting the electronic interaction across corporate boundaries. To cope with these challenges, we presented a modular reference architecture framework for electronic business media that overcome the drawbacks of today's B2B software products and services. We employed the reference architecture to the scenario of collaborative tax declaration in Switzerland to illustrate its real-word applicability. In this way, we proved that both the physical medium's design (service and infrastructure views) as well as the organization of agent interaction (community and process views) could be truly modularized. The advantages of our modular design include the following: First, a **decentralized design evolution** is enabled: Rather than being comprehensively governed by a single central institution, all module designers enjoy a high degree of design freedom and only have to comply with the set of globally visible design rules. Second, the huge complexity inherent in cross-organizational interoperation becomes manageable through modularization. Third, modularity accommodates for uncertainty: As business ecosystems frequently experience the need to change their structural and process-oriented organizations as well as exchanged documents, a truly modularized architecture provides a number of design **options**: "When a design becomes "truly modular", the **options embedded in the design are simultaneously multiplied and decentralized**. The multiplication occurs because changes in one module become independent of changes in other modules. Decentralization follows because, as long as designers adhere to the design rules, they are free to innovate […] without reference to the original architects or any central planners of the design" [11, p. 14].

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Semantic Integration of eGovernment Services in Schleswig-Holstein

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Abstract. The paper presents an example of e-government service integration on a semantic basis, as it was designed within the Access-eGov research project and applied in the Schleswig-Holstein state government. The case study follows up the application of a requirements-driven approach for designing e-government service interfaces with respect to the informational needs of citizens and business users. Using this approach, a conceptual model for e-government services was developed, formalised in the WSML ontology language, and used for semantic annotation of the services as a basis for integration. A subsequent field test was focused on the evaluation of produced semantic description on the client-side system components as Annotation tool and the Personal Assistant Client. The results of the field test have been evaluated and are presented in as lessons learned.

Keywords: Semantic interoperability, e-government, service integration, WSMO, user-driven approach.

1   Semantic Interoperability of E-Government Services

Given the diversity of information and processes on local and all upper levels of administrative services, semantic interoperability is perceived as a key aspect on the road to e-government integration and improved service quality. Multiple interoperability frameworks have put semantic interoperability on the agenda; for example the European framework [3, p. 16] defines it as "ensuring that the precise meaning of exchanged information is understandable by any other application that was not initially developed for this purpose" and enabling systems to "combine received information with other information resources and to process it in a meaningful manner". This framework also points out that the semantic interoperability is related to the specific e-government services as they are serving life event or business episode [3, p. 20].

The requirements of (semantic) interoperability, i.e. technical capability for inter-operation, derive from the challenges of integration: "E-Government Integration is the forming of a larger unit of government entities, temporary or permanent, for the purpose of merging processes and/or sharing information." [11]. Most integration cases in the area of e-government are concerned with merging existing and/or creating seamless electronic services.

Semantic integration of e-government services means in this context that all relevant information, which is processed to enable information sharing and process handling within seamless services, is based on successful mediation and/or translation of the meaning the processed information has for the service users (citizens, businesses, even other administrations) and/or for the service providers (one or more administrative units, maybe also private service providers).

Despite some available standardization, the main challenge of achieving semantic interoperability in e-government rests with the administrations as the providers of the services. For semantic integration based on Semantic Web technologies, machine-readable enhancements of process information are needed, based on understanding of the content. This cannot be done by a simple one-step procedure, and administrations, facing the paramount annotation effort required to enable machine processing, are still seeking for best practices that may guide them in these activities. Research is ongoing (e.g. [1], [2], [11]) but applying and testing semantic technologies and solutions on a large scale is quite a challenge in the huge, diverged and distributed environment of public administration (cf. [13]).

The underlying research question of this paper is: what are appropriate approaches which guide administrations effectively and efficiently in transforming their web resources towards the Semantic Web in order to achieve semantic integration of the provided services? By 'effectively' we mean successful in meeting requirements of administrations, citizens and businesses; and 'efficiently' refers to use of limited resources, scalability and applicability in real-life administrative environments.

The contribution of this paper is based on a case study conducted within the frame of the Access-eGov research project (see www.access-egov.org): we follow up on the application of a requirement-driven approach (proposed to support semantic integration of e-government services) in Schleswig-Holstein as well as on the subsequent field test in order to evaluate the efficiency and effectiveness of the applied approach, to discuss the lessons learnt and propose future research based on this case study. The data for this research was collected through individual documentation of workshops within the administration, analysis of design/development documents, "think-aloud" observations of administration staff members as well as citizens as service users, and online survey among service users. All authors of this paper have contributed to preparation, execution and evaluation of the Schleswig-Holstein experience for more than two years. However, individual contributions have contributed according to specific roles such as software developer, method developer, ontology creator, information manager, trainer, and evaluator.

The paper is structured as follows: the next section describes the semantic interoperability and integration challenges as well as the expectations towards Access-eGov technologies from the perspective of the Schleswig-Holstein state government. The third section briefly outlines the requirement-driven approach for (re-)designing e-government service interfaces and then follows up step by step the application of this

approach in Schleswig-Holstein. The fourth section focuses on the field test of the enhanced service interfaces and the retrospective evaluation of the design approach. The final section summarises the lessons learned, suggests improvements for practice and concludes with outlining future research.

2   E-Government Integration Challenges in Schleswig-Holstein

The German federal state of Schleswig-Holstein consists of 1,120 municipalities, which belong to eleven different districts (*Kreise*). While the larger municipalities have their own administration each, there are more than 900 municipalities with less than 2,000 inhabitants which share a common administration with several municipalities. All these administrations offer a set of services to their citizens, like issuing passports, wage tax cards, and different kinds of certificates or registration of enterprises, new places of residence, marriages, deaths, births etc., resulting in a huge amount of municipal services offered all over the state. In addition to these, there are services that are offered by administrations at the district, state and national level.

In a given life situation, for instance when wanting to build a house, get married or establish an enterprise, different offices of different administrations have to be contacted by a citizen to get the required documents, forms, permits etc. At the beginning of such a process, citizens often do not know which offices of which administrations they need to contact and they need to find the responsible administrations, using for example various government web sites. The e-government services of the different administrations are usually not integrated and cannot be accessed by citizens via a single platform. Therefore, citizens who want to use the e-government services have to access a variety of web sites to get the information on relevant services and to possibly also use them. On the other hand, each local administration offers mostly identical information on the same kinds of services.

The state government Schleswig-Holstein is aiming at integrating the different web resources containing the service information and at making these accessible via a single platform but still leaving the data and its maintenance in the administrations' legacy systems. An approach to this is suggested in the research project Access-eGov in which semantic annotation of web resources is supposed to make the meaning of the distributed information explicit and to thus allow to integrate it in a system interpreting this annotated data. The annotated data can then be used for displaying and searching the services, and also for generating a user scenario in which different services are combined according to a citizen's needs. For the semantic annotation however, a common conceptual model of the service descriptions is required: the relevant concepts, attributes and relations that make up a service description and the relevant administrative processes have to be identified and agreed upon.

In a field test in Schleswig-Holstein, accomplished within this research project, this approach has been followed on the example of the life event "marriage". In this life event, possibly different registry offices have to be contacted one after the other by a citizen to issue the required documents in preparation of the marriage. The services of the registry offices in Schleswig-Holstein were thus to be annotated on the basis of a common conceptual model and to be made accessible to the Access-eGov platform.

Eleven registry offices (responsible for about one fourth of the state's inhabitants) volunteered to participate in this field test. Their participation was bound to the condition that little time and effort would be required for service annotation and that existing IT systems would not necessarily have to be changed. Therefore, a tool for annotating data, which can easily be used in any environment and by untrained users, and which allows effective service annotation, was required.

3   Semantic Integration Based on a Requirement-Driven Approach

Drawing on information architecture and information quality concepts, Klischewski and Ukena [7], [8] introduced a requirement-driven approach for designing e-government service interfaces in relation to users' informational needs. The suggested process alerts the administrations to focus on the intended common understanding of citizens (or businesses) and administrations concerning the description of the service. The design approach includes the following tasks:

1. Identify informational needs: Analyzing prior knowledge of citizens and the diversity of informational needs of different groups of citizens.

2. Identify required information quality (IQ): Informational needs of each user group are analyzed with respect to required IQ properties: scope, relevance etc.

3. Create glossary of topics & terms: A glossary is created that contains all relevant topics and terms needed for describing the services in question; each entry provides a short description of the topics and the corresponding informational needs.

4. Create controlled vocabulary: Based on the glossary a controlled vocabulary is created: each service and general topic to be described should be represented by a main term and possibly additional related terms.

5. Group & relate terms: Relating all items of the controlled vocabulary through defined relations.

6. Design an ontology: Fixing the meaning of the terms and their relations in a formal way; verifying that formal meaning reflects informal description in the glossary (and vice versa).

7. Implement semantics: Use of the above constructs for service description and operation (e.g. creating service profiles in WSMO).

This approach has been applied in order to meet the integration challenges in Schleswig-Holstein and to improve the semantic interoperability between the technical systems involved. In the following, for each of the steps we describe the tools used and the outputs generated, as well as specific problems faced during application of the approach (due to limited space for presentation we combine the description of two subsequent steps).

3.1   Analysis of Informational Needs Required Information Quality

The first two steps were accomplished by specification of a scenario and use cases, described in a free-text form, which was then transformed into a more structured table

format containing identified information needs — goals and corresponding services. The scenario describes what two citizens, one with German citizenship and one with a foreign citizenship, need to do in order to get married, and how they use Access-eGov system (AeGS) to support them in manoeuvring through the administrative process.

A list of proposed services together with related information (laws and regulations, required documents etc.) was thus compiled as depicted in Table 1.

Table 1. Example: Identification of information needs (user's goals) and corresponding administration services

Goal, aim of the citizen	Corresponding service
Get a marriage certificate	**Name:** Issue a marriage certificate **Description:** If the citizens want to, they can obtain a marriage certificate after marriage. Also international marriage certificates can be obtained. **Responsible:** The register office at the marriage location **Costs:** 7 Euros (cost for further copies: 3.50 Euro)

For the user partners within the project, it was not always clear what kind of information was expected from them. So the tables for identifying information needs were constructed in tight co-operation with system developers, using UML diagrams and workflow modelling schemas to obtain a visual representation of the modelled entities. In addition, special attention had to be paid to the detailed description of spatial responsibilities of geographically distributed offices, in order to be able to integrate their services for the given scenario.

3.2 Creating Controlled Vocabulary

From the previous tables, a glossary containing all relevant topics and terms related to the modelled services was created in a table format with columns for the terms in German and English languages, accompanied with a short description what the term means and how it relates to other terms. The glossary terms were then grouped and organised into hierarchical subgroups of categories (see Table 2):

Table 2. Category *Document* from the Access-eGov controlled vocabulary

Category: **Document**	
Subcategories:	Certificate, Form, Notification, Payment Receipt
Attributes:	Title, Description of purpose
Description:	Used for concepts that refer to the artefacts as: *certificates* provided by the administration, *forms* to be filled in by citizens, *notifications* issued by an administration in order to inform a service consumer about certain changes in status, *payment receipts* which a citizen receives after having paid a fee.

3.3 Design and Implementation of Ontologies into the AeG Platform

As a next step (step 5), a set of other relations and mutual dependencies was identified between the categories and concepts, using the relationships expressed in the textual descriptions of the categories. In addition, elements of the WSMO conceptual model, enhanced and modified for the purposes of the AeGS [4], as well as several existing standards and ontology resources[1] were reused and combined with the categories from the controlled vocabulary. This resulted in a conceptual model, of which a fragment is depicted in Figure 1. The figure shows the identified domain concepts (represented as rounded squares) and their relation (represented as named arrows). The boundary objects [7], highlighted in grey, can be directly instantiated and were used to annotate the non-functional properties of the services.
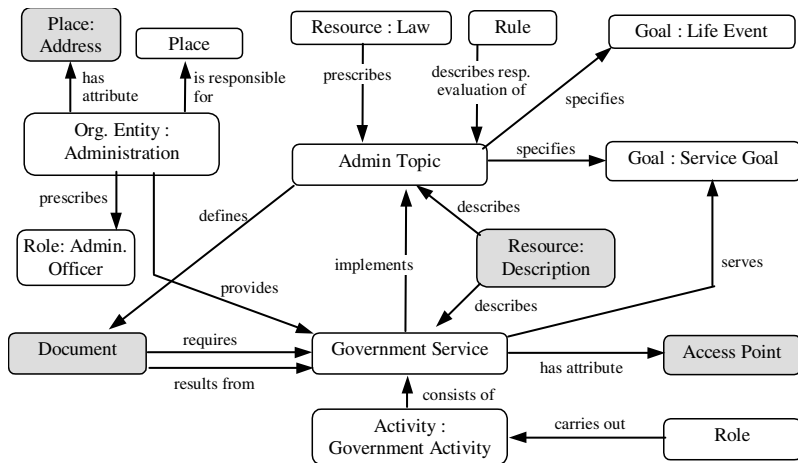
Fig. 1. Fragment of conceptual model, as it was identified for the Access-eGov system

Based on this model, the resource ontologies for life events, service profiles, and domain concepts were developed and implemented in WSML [4]. The resulting ontology was communicated back to the user partners (domain experts) by re-writing it into the tables of goals and services (Table 1) in order to verify that the formal meaning reflects the informal descriptions in the glossary. This proved to be necessary a couple of times and after several iterations, the meaning of terms and relations was fixed and the formal WSML representation of ontologies was produced.

3.4 Annotation of Government Services

The ontology specified in the previous step was further enriched by "business rules" consisting of conditional if-then-else expressions, loops, and workflow sequences, to

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[1] Namely, DublinCore (dublincore.org) was used for metadata and document types; vCard (www.w3.org/2006/vcard/) for addresses and personal data; WSMO ontologies for description of date, time, and location; Terregov, DIP, DAML, GEA, GOVML, AGLS metadata set, and IPSV ontologies were reused for description of specific e-government concepts [4], [7].

be capable of modelling complex structures of government services and scenarios. A common way for the semantic description of workflow structures is to use a choreography and orchestration process model. The WSMO framework provides the model based on the Abstract State Machines (ASM) [5]. However, the process model is used within the AeGS to guide citizens to achieve specific goals and to co-ordinate activities performed by all actors — citizens, traditional public administration services, and web services. Skokan and Bednar [12] have found that the current proposal of the WSMO specification [10] does not fit these objectives, because models based on state machines are not structured in a way suitable for the interaction with the human actors. For these reasons, an extension of the WSMO specification was designed and implemented [12]. The extended model is based on the workflow CASheW-s model [9], originally proposed for the OWL-S specification, with the dataflow and WSMO mediation extensions. The Access-eGov model reuses the state signature from the WSMO specification and replaces the ASMs transition rules with the workflow constructs. A shared ontology state signature allows reusing grounding of the input and output concepts to the communication protocols via WSDL. The workflow model consists of activity nodes. A node can be an atomic node (*Send*, *Receive*, *AchieveGoal* and *InvokeService*), or control node (*Decision*, *Fork* and *Join*).

The example below presents the WSML formalisation of the life event for marriage (expressed as a complex goal), by means of the orchestration interface:

```
namespace {_"http://www.accessegov.org/ontologies/shg/",
  dc _"http://purl.org/dc/elements/1.1#",
  aeg _"http://www.accessegov.org/ontologies/core/"}
goal MarriageLifeEvent
  nfp dc#title hasValue "Marriage" endnfp
  interface MarriageLifeEventInterface
   orchestration
    workflow
      perform n1_1 receive ?x memberOf Q1.
      perform n1_2 achieveGoal ApplyForMarriageGoal
      perform n1_3 achieveGoal WeddingPlaceReservationGoal
      perform n1_4 achieveGoal WeddingCeremonyGoal
    controlFlow
      source n1_1 target n1_2
      source n1_2 target n1_3
      source n1_3 target n1_4
    dataFlow
      source n1_1{?x} target n1_2{?x}
```

By interpreting this formal description, first the batch of answers to the pre-defined questions (Q1) needs to be received from the user by the process. Then the other subgoals (*ApplyForMarriageGoal*, etc.) need to be achieved in the right order. Transitions in the *controlFlow* part express that all the nodes are executed in a sequence. The *dataFlow* part specifies that the variable from the first node (n1_1, the batch of questions) is equivalent to the variable from the decision node (n1_2).

A formalised WSML representation of the ontology containing all the definitions (concepts, classes) of services, goals, and life events can be produced as a result of the 7-step procedure. To use this ontology in a real e-government application, the *Annotation Tool* [4] was designed in the Access-eGov project and implemented as a standard
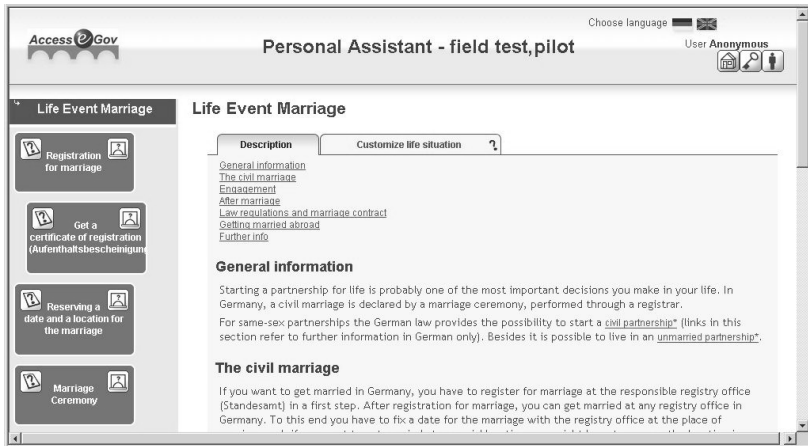
Fig. 2. Personal Assistant Client, user interface. Browsing the Marriage Life Event.

web application, using the WSMO object model and JSF technology. The Annotation Tool enables administration officers to specify the non-functional properties as parameters of the services. A template mechanism was implemented to ease the maintenance of pre-defined workflow sequences for the annotated services. The tool provides a simple user access control and multilingual support on both interface and data levels. In addition, a simple "content grabber" functionality enables linking a particular field in the form (i.e. the value of a service parameter, e.g. service hours of an office) with an element on an existing web site of the public administration. This solution enables the annotation of the external web pages and semantic integration of their content into a unified e-government application.

On the side of citizens, the *Personal Assistant Client* (Figure 2) was developed as a tool that provides browsing, discovery, and execution capabilities of proper services according to the specified life event or goal. In the following section, the field test of using the tools providing enhanced service interfaces and the retrospective evaluation of the design approach is described in detail.

4   Application Test and Evaluation of Design Approach

The objective of the field test in Schleswig-Holstein was to ensure the involvement of the public administration in order to include their domain expertise into the design of the ontologies, to evaluate if the citizens' and administration officers' requirements were met, and to test the components in a real world setting. In particular, by testing and evaluating the Personal Assistant Client, it was to be verified:

- if the information quality meets the requirements of the information consumer,
- if the information is provided in such units in the semantic mark-up component that it can be displayed in a sufficiently structured manner, and
- if the used information is correct from the service providers' point of view.

The first trial of the field test took place from October 2007 to January 2008. The results of this trial will be used for the further modification of the AeGS components.

4.1   Trial Test in Schleswig-Holstein

Two main phases of the trial can be distinguished: First, the administration officers had to create service annotations by using the Annotation Tool. After that, citizens where asked to use the Personal Assistant Client to retrieve information about these services.

The implemented ontologies (cf. section 3) together with the Annotation Tool were prerequisites for the beginning of the first phase. At this point, administration officers had a tool at their disposal to carry out the actual annotation of their services. In order to facilitate the annotation effort and support the administration officers, a training workshop was conducted during which officers in the participating administrations of Schleswig-Holstein started annotating the services that are related to the life event marriage. The annotation was completed successfully by all officers within a few weeks following this workshop. Officers who were not able to attain the training were provided with a short handbook on the usage of the annotation.

After completing the annotation procedure by the officers, citizens used the Personal Assistant Client to help them to locate the information about services related to marriage. In order to reach as many citizens as possible, announcements were released to the press as well as posted on the web sites of participating communities. In addition, the administration officers were asked to inform citizens about the availability of the Personal Assistant.

4.2   Evaluation of the Trials

The evaluation was carried out, using different tools for different target groups and test objectives: online questionnaires, "think aloud" sessions[2] [6], and user workshops. The evaluation of the Annotation Tool consisted of a user workshop and a "think aloud" session. The feedback was collected, prioritised, and provided to system developers in order to modify the tool accordingly. The Annotation Tool proved to be relatively easy to use and was even successfully used by untrained annotation authors who only had the short handbook at their disposal. Feedback from the officers during the workshop showed that the properties for the description of services met their requirements. However, for administrations that had to annotate the services of about 10 to 25 municipalities in their area of responsibility, the manual labor of entering the annotation was time-consuming. This was anticipated and partial automation of this process is planned for the second trial. The "think aloud" session revealed several issues regarding the usability of the user interface. Most of these have already been resolved during the first trial while some were postponed to the second trial.

The Personal Assistant was evaluated by a workshop with public authorities, as well as "think aloud" sessions and an online questionnaire, both aimed at citizens. With the online questionnaire, system users were asked to assess the system's information quality

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[2] Users were video-taped while using a prototype of the Annotation Tool and the Personal Assistant Client and were asked to say aloud what they are thinking when using the system to complete a certain task.

aspects, i.e. relevance and comprehensibility of the information, speed, structure and layout of the web site, as well as its navigation and usability in general. The aim of the "think aloud" sessions was to find out if the tool could support users in the specific life situation to manage the life event, to identify the required steps, the involved offices, and finding out what traditional or electronic services these offer, i.e. to compose the different services in such a manner that it could be understood by citizens. In the workshop for the evaluation, administration workers (service providers and Internet authors) were asked to discuss the Personal Assistant among each other. The results of the discussions were then collected and ordered according to priority from the participants' point of view.

These tests and the workshop resulted in a set of new requirements and change requests regarding usability of the system. With respect to the provided information and its structuring, citizens found that the descriptions were in some cases too long and not sufficiently structured. It seems that the textual descriptions of concepts in the ontology need to be adapted to a greater extent to a hypertext environment, i.e. as short texts with links to additional information instead of one long text. Furthermore, the usage of administrative terminology in the interface proved to be lead to misunderstandings in a few cases; the problematic terms were identified and were adapted to common language. Only few changes were required to ensure the correctness of the provided information from the service providers' point of view.

To summarise, the feedback from citizens and administration officers suggests that the main areas that require improvement are usability aspects of the respective user interfaces. The collected data shows no indication that the implemented ontology and the underlying conceptual model have any defects.[3] Furthermore, the conceptual model does not initially differentiate traditional and electronic services, thus giving the same labels to traditional and electronic services fulfilling the same goal. For citizens using the Personal Assistant this was confusing because they cannot immediately tell what kinds of services are offered.

5   Lessons Learned and Future Work

By using the approach outlined above, it proved to be possible to design an ontology for the annotation of service profiles, which could be used to integrate different services of different administrations that are relevant in a given life event. According to the achieved results and evaluation presented in the previous section, the requirement-driven approach to developing the semantic structures has proved to be effective as there were no major changes required to the ontology and conceptual model, neither with respect to citizens looking for services information nor with respect to administration officers annotating the services. To this end we conclude that the presented method is suitable as a framework for supporting the interoperability of heterogeneous government services provided by geographically and/or hierarchically distributed administration offices. However, several issues were identified by users as more or less problematic and will need further elaboration in the second prototype. We believe

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[3] It must be mentioned, however, that this is currently a conjecture which still remains to be verified in a more systematic way during the second trial.

that at least some of these lessons learned can be generalized on the field of e-government as whole:

(1) The glossary turned out to be a central artifact of communication between all actors involved in the design and implementation of the ontology. However, the intended usage of the glossary was not completely clear from the beginning. This led to some uncertainty how the terms in the glossary should be described. In practice, the description of the glossary terms was intended by its author (the information manager) to describe the relevant concepts *for* the developers *from* the user's point of view. This is in accordance with the approach as described above. However, the developers also used the descriptions from the glossary in prototype of the Personal Assistant Client *as is*. This was not anticipated nor intended by the information manager but seemed logical at the time from the ontology creator's point of view.

(2) The importance of the human-computer interface cannot be underestimated as it directly affects the usability of tools and has significant impact on user satisfaction and on the efficiency of the whole process. This interface, despite the sophisticated and complex technology behind, needs to be simple and intuitive, and should be in line with the life-event approach. Furthermore, in order to bypass the usability impact, the overall evaluation strategy should be amended by approaches (e.g. an electronic test agent) which do not primarily rely on human user activities and performance.

(3) Integration of electronic and non-electronic traditional services (one important aim of the Access-eGov project [4]) remains a challenge. It seems that on the semantic level the differentiation between traditional and electronic services is necessary, as non-electronic services need more initial effort for description and explanation in order to enable users to decide and select proper sequence of services according to their individual preferences.

The trial and its subsequent evaluation also revealed demand for future research, mainly concerning the scalability and efficiency of the requirement-driven approach. The main limitation of the first trial has been the existence of only a few pre-defined service scenarios (implemented as WSML statements); therefore it has to be ensured that the ontology will scale to all kinds of services that administrations have to offer, i.e. that the ontology can be used to represent all government services. This extension implies necessity to enrich the functionality of the Annotation Tool, which should support creation, customisation, and maintenance of all the required service descriptions and complex service scenarios.

Additional research is also necessary to validate that content of legacy systems, which contain (partial) service descriptions that lack semantic annotation, can be integrated as well. During the first field test, the Annotation Tool has been used as a means of semantically annotating service descriptions manually, which resulted in duplicate data if the data existed already in legacy systems. Again, for efficiency reasons is not desirable from the service provider's point of view. A "content grabber" and a Web service based approach are being investigated for the second trial as a possible solution to automatically collect relevant service descriptions from annotated web resources and legacy systems.

All in all, the state government of Schleswig-Holstein considers the trial application of the requirement-driven approach for designing machine-readable services

interfaces as a successful step towards semantic integration of its e-government services. At the time of writing, dissemination activities are ongoing aiming for continuation of this integration approach, even beyond the state's geographical and electronic borders.

Acknowledgments

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Semi-automatic Ontology Construction for Improving Comprehension of Legal Documents

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Abstract. In this paper we present a new method based on semi-automatic ontology construction that can be used to improve the understandability of legal documents. Legal documents typically extensively define requirements and procedures in a specific legislative area; usually, they are hard to comprehend for citizens without a proper legal knowledge. However, a vast majority of today's e-Government activities for citizens (G2C) are governed by legal documents. Therefore, by improving the citizen's comprehension many intricacies that occasionally occur during G2C activities can be avoided. Our method first divides a legal document into several paragraphs. From the paragraphs it semi-automatically constructs ontology of the field by using a tool OntoGen. Ontology concepts are then used to classify each paragraph and the resulting classification is visualized in a simple matrix, where rows represent paragraphs and columns represent top-level ontology concepts. Based on the visualization, paragraphs that need revising are identified; they can be relocated to more suitable context within the document or rewritten using more appropriate wording. We demonstrate the presented method on the document defining the tender for selling flats at favorable prices at the Housing Fund of the Republic of Slovenia, a public fund. We argue that by using the new method we were able to substantially improve the comprehension of the document. In addition, the constructed ontology helped the Fund's officers improve the structure of their knowledge about the underlying business process.

Keywords: ontology construction, knowledge management, legal documents.

1 Introduction

For decades, scientists have used ontologies as a means to systematize scientific information and to provide a common vocabulary of concepts for exchanging information. Ontologies have the capability to contribute to common understanding of problem domains. Therefore, they are capable of supporting research with the ability to reason over and to analyze the information at stake [1]. As a result, ontologies are most commonly used as a form of knowledge representation. Typically, ontologies consist of descriptions of objects, concepts, attributes and relations between objects.

Until recently, ontology construction relied mostly on manually identifying some interesting concepts and organizing them in an appropriate hierarchy. In the process, some sort of language was used to represent manually extracted common sense knowledge from various sources. Lately, several programs that support manual ontology construction have been developed, like for example Protégé [2]. However, since manual ontology construction is a complex and demanding process, there is a strong tendency to provide more active computerized support for the task.

With the emergence of new knowledge technologies, ontologies can be constructed semi-automatically by processing textual data at hand. In recent years, many tools that help constructing ontologies from texts in a given problem domain were developed and successfully used in practice [3]. Therefore, the process of ontology construction can be made more effective and feasible in practice. Based on text mining techniques that have already proven successful for the task, OntoGen [4] is a tool that enables interactive construction of ontologies from text documents in a selected domain. A user can create concepts, organize them into topics and also assign documents to concepts. With the use of machine learning techniques OntoGen supports individual phases of ontology construction by suggesting concepts and their names, by defining relations between them, and by automatic assignment of documents to the concepts [5].

Nowadays, citizens are faced with vast amounts of legal documents that govern their everyday activities. Most of such documents are difficult to read and comprehend for an average person. Usually, misunderstandings that arise are handled within or after the process and require substantial amount of human resources. In the field of e-Government services to citizens (G2C), improving the comprehension of legal documents can thus be considered as a task that both improves citizens' satisfaction with the services and saves time and money at the same time. Note that a formal representation of knowledge in the form of ontology can be effectively used to communicate the key concepts from the responsible officers to citizens.

As an important Slovenian public institution, the Housing Fund of the Republic of Slovenia, a public fund, has been actively involved in several tasks with the intention of improving the housing conditions for the citizens of Slovenia. In the first period, the Fund started offering the loans under favorable conditions to the individual housing investors [6]. Afterwards, its focus changed to encourage individual housing savings by offering attractive Housing Savings Schema to citizens. The motivation for this action was to direct considerable amount of financial resources from consumption to savings, which has, among other affirmative things, turned out to have a positive effect on Slovenian economy [7]. Even though the Fund operates most of its businesses as a part of the public sector, the underlying requirements for its activities demand organizational form of an enterprise. The Fund has a unique position within Slovenian economy, which puts it under considerable media attention.

In the past years, effective public communication has been one of the key priorities of the Fund's management. Even though the task of preparing legal documents governing the Fund's business activities was every time carried out with a great care, there were cases that evidently reveal the lack of public understanding of the Fund's requirements and intentions. Sometimes, especially in the case of public tenders for selling flats to citizens, media contributed to confusions about the issues at stake. Therefore, the task of introducing a method for improving the understandability and clarity of presentation is well supported by the Fund's management.

This paper is organized as follows. First, we give a short overview of ontology construction approaches in e-Government area. In section 3 we describe the Housing Fund of the Republic of Slovenia and its role in Slovenian e-Government initiative. Section 4 presents a new method based on semi-automatic ontology construction and knowledge management techniques to improve the comprehension of a legal document for citizens. Section 5 discusses the presented approach. The most important findings are summarized in the conclusions.

2   Related Work

As already mentioned in the introduction, the use of ontologies is becoming more and more evident in many aspects of our lives. Ontologies facilitate many processes and put them in a wider perspective by structuring, managing and retrieving different kind of information [8]. By searching the Web we can find many services and projects that are based on using ontologies. The same holds also for the field of e-Government, where common understanding of information between people and services is very important.

E-Government services are typically dealing with several different types of data. Ontologies typically facilitate communication between such services and citizens, as well as between services themselves. In such way ontologies guarantee information interoperability between various e-Govenment services. We can find several cases where e-Government services are using ontologies; for example, in the situation of citizens' life events, public participation in the legislation process, changes of circumstances that have impact on many services at the same time, etc.

We often say that we live in times when changes are the only certain things in our lives. To be able to adapt to those changes, knowledge is becoming a commodity that needs to be constantly upgraded. Success of companies and e-Governmental services depend mostly on knowledge management techniques.

In last years, e-Government services have become one of the key enablers for interoperability of e-Government applications. Many policy makers stress the importance of knowledge management and several ongoing research projects prove the affiliation to this topic [9]. Some of these projects use onotologies to show structure and relations, so knowledge management can be set out in structural and understandable way for services and citizens.

Ontologies can be constructed manually or in a semi-automatic way. During the manual construction users create their own concepts and introduce relations between them. A good example of a tool for manual construction of ontologies is a platform named Protégé, which supports two ways of modeling ontologies. One way is in accordance with the Open Knowledge Base Connectivity protocol (OKBC) and the other one is based on Web Ontology Language (OWL) [2].

On the other hand, ontologies can be constructed semi-automatically. An example of a tool for semi-automatic construction of ontologies from text is OntoGen that is designed to combine text-mining techniques with an efficient user interface to reduce a set of topics with variety types of relations. This system allows users to make a more complex ontology in less time, but still have a full control over whole process by choosing the suggestions system gives [4]. Based on text mining techniques that

have already proven successful for the task, OntoGen is a tool that enables interactive construction of ontologies from text documents in a selected domain. A user can create concepts, organize them into topics and also assign documents to concepts. With the use of machine learning techniques OntoGen supports individual phases of ontology construction by suggesting concepts and their names, by defining relations between them, and by automatic assignment of documents to the concepts [5]. The input for the tool is a collection of text documents. Documents are represented as vectors, which is often referred as vector-space model. Using this representation, similarity between two documents can be defined as the cosine of the angles between the two corresponding vector representations. When suggesting new concepts, OntoGen uses K-means clustering technique [10] and keyword extraction method [11].

One of the e-Government projects that deal with knowledge management and ontologies is a EU project named QUALEG (Quality of Service and Legitimacy in e-Government) [12]. Its aim is to enable local governments of France, Poland and Germany to manage their policies in a transparent way and enable adaptability of the proposed solutions. The project showed many advantages of using technology based on ontology, such as preventing redundancy of data representation, enabling adaptability and supporting the realization of the importance ascribed by the local language to topics through the use of multiple synonyms.

Project LEX-IS is another EU funded project that deals with this context. Its main objective is to improve the legislation process in the National Parliaments through enhancing public participation with the use of technology-based tools like ontologies. Developing ontologies helped all of the involved parties to easily locate and interpret important information [13].

3 The Role of the Housing Fund in e-Government

The Housing Fund of the Republic of Slovenia, a public fund was established by the Housing Act to finance the National Housing Programme and to promote housing construction, renovation and maintenance of apartments and residential houses. In the past decades the Fund went through basic changes on both national and business level. Events like the independence of Slovenia, the inclusion in the EU, as well as the progress in information technology and the development of the Internet required constant adjustment of the Fund's business strategies and activities.

In its first years, the Fund directly supported citizens' initiative in private housing building and non-profit housing organizations by offering loans under favorable terms. Then, at the dawn of the century, the Fund took part also in stimulating citizens for housing saving introducing the National Housing Saving Schema, whose main goal was to improve housing status of Slovenian citizens. This was a big obligation on one side; on the other, it was a great challenge.

In comparison with the other EU members, Slovenians have extremely low share of rented apartments. Over 90% apartments are private property. Moreover, a lot of building parcels are hard to reach and are not available on the market. The prices of parcels and apartments are high with respect to the purchasing power of citizens. Because of that, the Fund is striving to increase supply of newly constructed flats and to help Slovenian citizens in their first attempt to consolidate their housing status. This

way it helps to reduce the housing gap between Slovenia and other EU member states. Also, the Fund is becoming more and more actively included in the real estate market.

The Fund's task that received most of a public and media attention was the task of selling apartments to citizens at favorable prices [14]. From 2002 until today the Fund sold over 1.800 apartments. Under the circumstances on the Slovenian real estate market, where the prices are relatively high and the lack of apartments is evident, the Fund was forced to set priority classes for applicants. Selling apartments begins with the preparation of tender requirements and tender documentation, which are documents based on valid legislation, and analyses prepared by professional services of the Fund. Both, tender requirements as well as tender documentation are then verified by the board of directors.

The business process of selling commercial apartments consists of the following six phases [14]. First, the Fund prepares a proposal for housing sale and publishes it the media and on the Internet. Second, interested applicants fulfill the prescribed form. Third, received applications are identified and validated by the Fund's officers. Next, all complete applications are ranked according to their priority and allowed to participate in the process of apartments' distribution. When two or more applicants fall into the same priority rank, random choice as the fifth phase is used to select a single buyer for each apartment. In the sixth phase, all the applicants are notified about the outcome of the apartments' distribution sub-process.

After the selection is done, applicants are informed about the outcome of the tender. The selected buyers are then invited to sign contacts. The Fund then monitors the buyers' payments according to their contractual obligations and informs them if anything new happens during the time of construction.

The Fund reached high level of maturity in last years. However, in its visions it needs to manifest more energy and determination to include knowledge management in its strategic plans. Employees have to learn how to better use their knowledge in daily routine. Special attention should be given to ensure continuous development of its information system, which would in turn help to effectively mange resources and knowledge.

4   Semi-automatic Ontology Constructions for a Public Tender

The Fund's most notable activity in the past years was carrying out public tenders for selling flats to citizens [14]. The underlying business process received considerable media exposure and other pressures from citizens and government, mostly due to delicate nature of the domain. Also, there were cases when the provisions of the tenders were hard to understand for general public. One contributing factor was the inherent complexity of the task. However, even though the clarity of the legal document stating the provisions of the tender was not yet publicly questioned, there were some indications that improving the structure as well as the contents of the document would substantially increase the document's comprehension.

As a result, our goal was to design a method that would help the Fund's officers to improve understandability of legal documents to citizens. In addition, we wanted the method to be generally applicable to any well-structured legal document. Here, well-structured means that the document is prearranged into sections and paragraphs, where

the paragraphs conform to the standard requirement that they deal with a single topic. The obtained results were evaluated by the experts and presented in the discussions.

The proposed method for improving understandability of legal documents consists of several cycles. The aim of each cycle is to improve the structure and wording of the paragraphs identified as outliers. Outlier paragraphs are selected based on visualization of the document using top-level ontology concepts. The underlying assumption is that in a well-structured document that is easy to comprehend neighboring paragraphs should deal with similar topics using similar wording and expressions.

Each cycle of the proposed method consists of six phases: decomposition into paragraphs, text preprocessing, ontology construction, visualization, identification of outlier paragraphs, and correction of the identified outliers. Each phase is further described in the following paragraphs and illustrated on the target legal document describing the Fund's tender.

In the first phase the document is decomposed into several paragraphs. Normally, the document's original paragraph structure is used. Groupings of the paragraphs into sections are not important in this phase, since each of the paragraphs are treated as a separate body of text in the process of semi-automatic ontology construction with OntoGen. However, when presenting the document as visualization of ontology concepts, the structure of the sections becomes important.

In the second phase, all the paragraphs are preprocessed with lemmatization and exclusion of stoplist words. Lemmatization is used to eliminate various forms of a single word. Stoplist contains words that are predictably of no interest and should, therefore, be excluded from the text. So, all the terms that are not domain specific should be ignored. Both, lemmatization and stoplist word exclusion are language sensitive, so they should be adapted accordingly. Not that in our example case the legal document was in Slovene language.

The third phase consists of using OntoGen as a tool to construct top-level ontology concepts from the prepared preprocessed paragraphs. Expert's intervention is required in this phase. Determining the proper number of top-level concepts for a specific field is very important when constructing ontologies in a semi-automatic way [15]. The goal is to find a well-balanced tradeoff between the complexity and comprehensibility of the single level ontology concepts in the domain. However, experimenting with other values of this parameter may also reveal some interesting domain properties. In our example document the expert found out that the best tradeoff value is 3. So, the top-level ontology in Fig. 1 consists of three concepts following from the *root* node. The decomposition propagates to lower levels according to expert's guidance. The whole constructed ontology is depicted in Fig. 1. Descriptions of ontology concepts are presented also in Table 1. Here, also the mnemonic labels are added so that the concepts can be concisely used for the visualization of the legal document.

The fourth phase includes visualization of the legal document by using decomposition to paragraphs and top-level ontology concepts. Here, the grouping of the paragraphs into sections comes into play. In Table 2 all the document's paragraphs are presented as rows and labeled as sections and paragraph numbers (in parenthesis).

Fig. 1. An ontology generated semi-automatically from the preprocessed paragraphs of a legal document. The concept names were proposed by OntoGen and modified by the expert.

Each paragraph is then classified into one of the ontology concepts, as proposed by the OntoGen and labeled in Table 1. The ontology concepts are presented as columns in Table 2. The pattern in Table 2 reveals the similarity of adjacent paragraphs in terms of the ontology concepts they belong to. As a rule of a thumb we can say that the more similar the adjacent paragraphs are, the better the understandability of the selected legal document is.

In the fifth phase the outlier paragraphs are identified from the generated visualization. The outlier paragraphs are detected by observing the classification to ontology class. When a paragraph is classified to a different class than its neighboring paragraphs within a given document section, it becomes a candidate for outlier. The more distant its classification is in the ontology hierarchy, the more likely it requires modification to improve the overall comprehensibility of the document.

Based on the outlier paragraph identification in the previous phase, the officers can take several actions. First, they can rephrase the paragraph using more suitable wording from the desired ontology class. Second, they can move the paragraph to a more suitable context within the document. The new context can be determined so that the

Table 1. Labels and descriptions of the constructed ontology for the legal document

label	description
1	**the Fund, buyers, procedure**
11	the Fund
111	buyer's view
112	appartment's view
12	buyers, selection
2	**appartments, categories, criteria**
21	appartments
22	criteria used in the tender
23	preferential categories of buyers
3	**tender, applications, contracts**
31	application ranking, young families
32	applications, contracts

neighboring paragraphs fall in similar ontology classes as the moved paragraph. And third, they can decide that the paragraph is clearly written and that its position within the document is well justifiable; in such way the experts can override the suggestion proposed by the method and OntoGen.

5 Discussions

Legal documents are in most cases like mathematical articles; they are supposed to cover and handle all the possibilities within a given context. Therefore, the loss of understandability is sometimes the price we have to pay for the sake of completeness. Even though the document contents might be syntactically and semantically correct, it can be difficult to understand for non-expert public. However, we claim that by using the method demonstrated in the previous section the understandability of a processed document can be improved without a loss of completeness and main focus. Our practical results and the evaluation from the legal expert support this thesis. Improving clarity of legal documents can reduce intricacies that occur due to misunderstanding or misinterpretation. Therefore, improving the comprehension is the goal of all the public bodies that are responsible for preparing legal documents that are intended to be use by the general public.

The application of the presented method to a legal document is rather straightforward. In a single cycle a user just has to follow the steps enumerated and explained in the previous section. The resulting document from a single cycle can be then used as an input for the second cycle, until the satisfactory improvement of comprehension of the target document is achieved. However, note that the presence of the domain expert is needed for semi-automatically constructing ontology concepts and for evaluating the final results.

When searching for outlier paragraphs in Table 2, one should have in mind that the classification of the paragraphs to ontology concepts is probabilistic in nature. Therefore, the paragraphs are associated with ontology concepts with the highest probability.

Table 2. Labeled paragraphs of the selected legal document and their classification into ontology classes

	1			2			3	
	11		12	21	22	23	31	32
	111	112	120	210	220	230	310	320
I			�					
II_a_(1)			�					
II_a_(2)				▪				
II_a_(3)		▪						
II_a_(4)		▪						
II_b_(5)				▪				
II_b_(6)						▪		
II_c_(7)							▪	
II_c_(8)						▪		
II_c_(9)							▪	
II_c_(10)					▪			
II_c_(11)						▪		
III_(1)				▪				
III_(2)					▪			
III_(3)						▪		
III_(4)					▪			
III_(5)					▪			
III_(6)			▪					
IV_(1)								▪
IV_(2)				▪				
IV_(3)	▪							
IV_(4)			▪					
IV_(5)								▪
IV_(6)			▪					
IV_(7)								▪
IV_(8)								▪
IV_(9)								▪
IV_(10)		▪						
IV_(11)		▪						
IV_(12)	▪							
IV_(13)								
IV_(14)								▪
IV_(15)			▪					
IV_(16)			▪					
IV_(17)	▪							
V_(1)					▪			
V_(2)							▪	
V_(3)								▪
V_(4)								▪

This suffices for the requirements of the proposed method; however, for a more detailed analysis the measure of similarity between the paragraphs from OntoGen could be used. In such way, also the contribution of some minor changes in the paragraphs to the target document clarity that are not immediately reflected in Table 2, can be adequately presented in the final analysis.

In the rest of the discussions we would like to further demonstrate the phase of the method that was used to identify the outlier paragraphs in Table 2. Besides, we would like to comment on the changes to paragraph contents and structure proposed by the experts.

The first identified outlier is paragraph II_a_(2). Since it mainly deals with apartments and categories, and not with buyers and procedure as the rest of the section II_a, the experts suggested it is moved to section II_b. As a result, all the paragraphs in section II_a dealt with the issues related to the Fund, buyers and procedures, which in fact means that the whole section in Table 2 became all "light".

In the case of paragraph II_c_(8), the expert's suggestion was to rephrase it by using wording from the concept 3 (tender, applications, contracts). This way, we obtained a new modified paragraph, which perfectly fitted with the other two already in section II_c. As a result, the first three paragraphs from section II_c in Table 2 became all "dark".

For paragraphs IV_(1), IV_(2), IV_(5) and IV_(14) the expert suggested to keep them at the original place. They argued that the presented information was well required at this exact location of the target document, even though it dealt with a different topic that the neighboring paragraphs. However, slight modifications were proposed to introduce more focus on the procedure and less on the apartments.

The paragraph V_(1) was obviously too long, so the expert proposed to divide it in two or three sections. Note that one of the consequences of too long paragraphs is that it is difficult to determine their main topic. Therefore, the natural solution is to balance the structure and the contents by introducing more consistent and coherent paragraphs. Also, the experts proposed to introduce more focus on the tender and less on the procedure.

After completing all the proposed changes by the experts, the target legal document became evidently more readable, which was the actual purpose of the proposed method. By the opinion of the Fund's officers, the updated document was also much easier to understand than the original target document.

6   Conclusions and Further Work

We have presented a new method for improving the understandability of legal documents that is based on semi-automatic ontology construction from text. The main advantage of using the method lies in the fact that by improving the citizen's comprehension of legal documents many intricacies that occasionally occur during G2C activities could be avoided. We have explained the presented method on the document defining the tender for selling flats at favorable prices at the Housing Fund of the Republic of Slovenia, a public fund. This method is used regularly for the in-house knowledge management issues. The Fund's officers are, therefore, able to revise the coherency structure of their written regulations to become better understandable for citizens. The obtained results were evaluated by the experts from the field. They argued that the comprehension of the target document improved substantially. Also, the constructed ontology helped the Fund's officers improving the structure of their knowledge about the underlying business process.

The presented method, although demonstrated on a single legal document, has a broader impact. In fact it can be used to any legal document to improve its comprehension. The document paragraphs are clustered according to their ontological group using data-mining techniques. Additional benefits are also semi-automatically constructed ontology of the concepts that can be used to describe and present the legal document in more abstract way and visualization of the legal document in a simple matrix. Based on the visualization, paragraphs that need revising are identified; they can be moved to more suitable context within the document, or rewritten using more suitable wording.

For further work we consider experimenting also with various approaches to text preprocessing in different languages. In particular we have in mind lemmatization and stop words determination. Both tasks depend on the language and typically require expert's intervention. Also, the visualization of legal documents using notation in Table 2 should be extended to include paragraph similarity measure provided by OntoGen. In such way the method would give the experts not only the list of outlier paragraphs, but also the ordering of the paragraphs from the most to the least problematic. Up to now, the evaluation of the proposed method was carried out by the experts on subjective basis. So, we plan to evaluate the impact of our method to the understandability of legal documents in a more objective manner by conducting questionnaires on the representative sample of citizens.

Acknowledgement

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Paving the Way to eGovernment Transformation: Interoperability Registry Infrastructure Development

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Abstract. During the last decades eGovernment has been a vivid, dynamic research and development area. As services are being transformed, electronic documents and web services appear every day in many countries, the involved stakeholders are in urgent need for an instrument to structure governmental administration processes, service composition and provision - in a way that eGovernment transformation can be constantly managed. This paper presents the creation of an eGovernment ontology, and the development of a knowledge-based registry of governmental services in Greece. This Registry is an advanced web portal, devoted to the formal description, composition and publishing of traditional, electronic and web services, including the relevant electronic documents, information systems and as well the process descriptions and the workflow models in an integrated knowledge base. Through such a repository, the discovery of services by users or systems has been automated, resulting in an important tool for achieving interoperable eGovernment transformation.

Keywords: eGovernment, Registry, Ontology, Knowledge Management, Semantic Interoperability.

1   Introduction

Today, Public Administrations are striving to leverage modern information and communications technologies to improve the quality of their services to citizens and businesses, to provide multiple communication channels and to make their internal and cross-organization operations more efficient, even if this requires changing their modus operandi. In order, though, to fully realize the e-Government potential for productivity growth, it is not sufficient to modernize the front office by offering public services over the internet through e-Government portals [1]. The e-Government era implies fundamental knowledge redistribution and requires a careful rethinking of the management of information resources and knowledge bases [2]. Ample access to remote information and knowledge resources is needed in order to facilitate:

- Citizens' and businesses' oriented service delivery including one-stop service provision,
- Inter-organizational co-operation among governmental agencies
- Cross-border support for complex administrative decision making.

- Limit the loss of critical knowledge assets during the life cycle of e-Government services

The concept of knowledge management (KM) is not new to the public sector; either intentionally or unintentionally, KM initiatives have always been integrated in government tasks, inseparable from strategy, planning, consultation and implementation [3]. More and more governments are realizing the importance of KM to their policy-making and service delivery to the public and some of the government departments are beginning to put KM high on their agenda. Societal responsibilities, for delivering public policy that benefit the common good further enhance the importance of effective KM in public services [4].

In this context, the use of eGovernment Registries can enhance the access to and delivery of governmental knowledge, information and services to the public and other governmental agencies and bring about improvements in government to operations that may include effectiveness, efficiency, service quality or transformation.

This paper presents an ontological approach of developing an eGovernment Registry in the context of the Greek eGovernment Interoperability Framework, following the structure below: In the second chapter, a state of the art analysis around ontologies and repositories for eGovernment is conducted. The proposed eGovernment Ontology is introduced in chapter 3. Chapter 4 outlines the Interoperability Registry Platform leading to chapter 5 that dives into more detail regarding the eGovernment Services Registry. In chapter 6, the first results of the Registry's population are presented leading to conclusions / further work in chapter 7.

2   Ontologies and Repositories for eGovernment

In the span of this work related research efforts on Ontologies for eGovernment-aspects were examined and reviewed. The main findings upon which our approach builds originate from the following relevant work:

- Ontologies for the description of e-Government knowledge [5] and the guidance in the design of e-Government portals [6]
- Ontologies describing organizations and individuals participating in a government R&D programs [7]
- Ontologies analyzing Government Concepts Used in the CIA World Fact Book 2002 [8]
- Ontologies developed or being developed in the context of EU-funded Research Projects in the area of e-Government, like the DIP e-Government Ontology [9] and the OntoGov E-Gov Lifecycle Ontology [10], in Legal Issues, like the Estrella Legal Knowledge Interchange Format [11] and LEX-IS Ontology for Legal Framework Modelling [12], and in Data Modelling [13]
- Ontologies for e-Government public services that have emerged from research like [14] and Arianna [15]
- UK Government Common Information Model (GCIM) [16] as a high-level information model for all activities undertaken by the public sector
- Governance Enterprise Architecture (GEA) [17] that includes a set of domain models describing the overall governance system and serving as a top-level enterprise architecture

State of the art in Registries and Repositories for the public sector typically falls within the jurisdiction of the current European or National e-Government Interoperability Frameworks. In most cases, however, such repositories try to cover the semantic aspect of interoperability with XML schemas for the exchange of specific-context information throughout the public sector within the country borders and do not interfere with service descriptions or web services deployment. For example in the European Union:

- The United Kingdom has developed the XML Schema Library [18], containing approximately 78 XML Schemas.
- Denmark has designed the InfoStructureBase system [19], including an international standards repository with business process descriptions, data-model descriptions, interface descriptions, complex XML schemas and schema fragments (information object) from public and private organizations and an UDDI repository containing information on web services.
- Germany has the XML Infopoint [20], where information on planned, current and completed projects with an XML reference is gathered, and is to be replaced by the oncoming XML Repository, a central point providing data models for reuse.
- In Italy, one can find a similar approach in Arianna project [15], which has defined an ontology for e-Government public services and deployed a repository containing service descriptions mainly at local level.

Gaining knowledge, best practices and lessons learnt from the above similar but partial attempts, Greece has deployed such an infrastructure that can effectively support the interoperable operation of governmental systems through providing for service composition, discovery and use in a utility-like way, as presented in detail in the following chapters.

3   The Proposed eGovernment Ontology

The eGovernment Knowledge Interoperability Ontology (eGKI) is a two-layer ontology, aiming at capturing and interconnecting the knowledge elements to be met during manual or electronic services provision to citizens or businesses. The Ontology consisting of 37 classes, 131 datatype properties, 83 bidirectional object properties (reflecting the relations between the classes) and more than 60 restrictions. It is formalized using OWL [21], since it is a standard language for representing ontologies on the web. The ontology has been developed using open source ontology editor, namely Protégé [22] and has been successfully checked for inconsistencies using the trial version of the Description Logic Reasoner RacerPro [23].

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, while the bottom layer incorporates more technical details.

3.1   The Top-Layer eGKI Ontology

The eGKI Ontology includes the definition and the representation of the following basic entities – classes:

- Services provided in conventional or electronic means by the public authorities to the citizens and businesses.
- Documents, in electronic or printed format, that constitute the inputs or outputs of a service or are involved during their execution.
- Information Systems, which encompass the web portals as well as the back-office and the legacy systems.
- Public Administrations that embrace all the service points and the authorities of the public sector.
- Web Services for the interconnection and the interoperability among information systems.
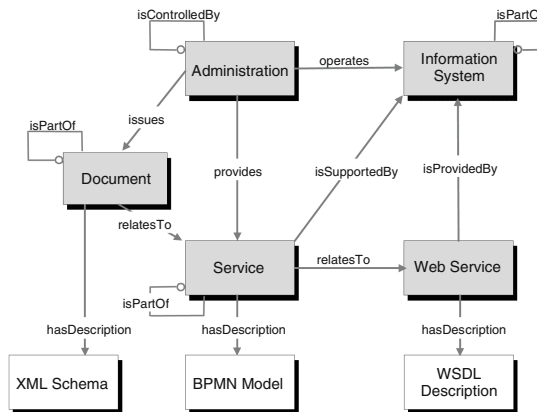
Fig. 1. The top level of eGKI Ontology

As depicted in Fig. 1, the entities are also connected to BPMN descriptions, XML Schemas or WSDL files for the analysis of services, documents and web services. The eGKI Ontology also analyzes and incorporates concepts, like the Core Components specification [24], the Code Lists for Public Administrations and Countries, for example.

3.2 The Bottom-Layer of eGKI Ontology

The bottom-layer of eGKI Ontology encapsulates all the aspects related to e-Government Services composition and execution. In principle, the lifecycle of an e-Government service starts when a citizen or a business or a public administration triggers the generation or the change of a service. In order to provide a service, a public administration needs to have a high-level view of the service model, links to related laws, resources involved and inter-relations with other services. In more detail in the eGKI ontology:

A service can be provided in a conventional way (becoming an instance of the class Service), by electronic means like web portals or cell phones (thus instance of the class Electronic_Service) or as web service incorporated in back-office systems and applications (attributes of class Web_Service).

Fig. 2. The bottom level eGKI Ontology in Protégé

The class Document contains the information that is related to a manuscript or electronic document that emerges as input or output of a service, is involved in the execution of a service or is deliverable of a project. The class Structured_Document contains the document - related information together with the analysis of the document fields and the XML Schema definition.

The class Public_Organization embraces any governmental authority, from ministries and prefectures to municipalities and other governmental organizations.

The class Information reflects the informational material that is associated with a service.

The class e-Gov_Extended_Entity is broad and generic, usable for describing a wide range of resources, apart from the entities (service, document, public body and information system) that have been specified in the other classes of the parent class e-Gov_Core_Entity.

The class Information_System contains details about the information systems that support the everyday operation of public bodies and their transactions.

The class XML_Data_Entity refers to data which is structured in XML syntax, like Code Lists, XML Schemas and the Components and Data Types on which they are based. A Core Component Entity has the subclasses Basic_Core_Component and Aggregate_Core_Component that identify whether a data field in a XML Schema is simple or complex. The classes Basic_Government_Information_Entity

and Aggregate_Government_Information_Entity inherit from and extend the classes Basic_Core_Component and Aggregate_Core_Component, respectively. The siblings of the class Data_Type_Entity distinguish between Unqualified_Data_Type and Qualified_Data_Type on the basis of whether they impose additional restrictions on the approved core data types.

The class Legal_Entity and its subclasses capture the information of the legal and statutory framework for service provision (e.g. Legal Frameworks, Legal Elements, Rules, etc).

The class Physical_Entity identifies the individuals or businesses that participate in a service and can be extended in the public servants that are employed in a public organization.

Specific metadata in the form of data properties are inserted for the e-Gov_Core_Entity class and its subclasses as prescribed in the Documentation Model of the Greek eGovernment Interoperability Framework [25]. The datatype properties of the XML_Data_Entity and its siblings align with the UN/CEFACT Core Components Technical Specification [24]. An example of the aspects of a service incorporated and extended in the eGKI ontology has been presented in [26, 26].

4   The Interoperability Registry Platform

The architecture that implements the Interoperability Registry comprises of three layers: (a) the Web-based and UDDI (Universal Description, Discovery and Integration) interfaces for various groups of users, (b) the tools layer including ontology management, process and data modelling and (c) the information repository for interconnected data elements, process models, XML schemas and Web Services descriptions. These three layers, as shown in Figure 3, are integrated through a relational database engine (based on Microsoft SQL Server) and common access control and application engine integrating the tools level with the various interfaces.

The front-end platform components are as following:

- The Interoperability Framework Web Site found within the Greek eGIF Web Site [25], which publishes the various documents of the eGovernment Framework but also gives access to citizens and businesses for publicly available data.
- The Services Registry, accessible to authorized users that gives access to the Registry Tools (meta-data management, process and data modelling). The representation of the Services Registry is mainly the scope of this paper and the system will be extensively described below.
- The Registry UDDI interface, where administrations publish their Web Services or find existing, available Web services to use through their information systems, constructing truly interoperable, one-stop services.

The Tools layer comprises:

- The process modelling facilities, based on ADONIS modelling engine.
- The XML Management facilities, based on ALTOVA XML Authorware.

- The custom-developed ontology management, data entry and reporting tools that integrate all representations and models. This is the software implementation of the Services Registry and will be thoroughly discussed in the next section.

Finally, the Data Storage layer incorporates an aggregated database for the ontology instances as eGovernment elements, the Web Service descriptions in WSDL, the process models and the XML schemas and Core Components.
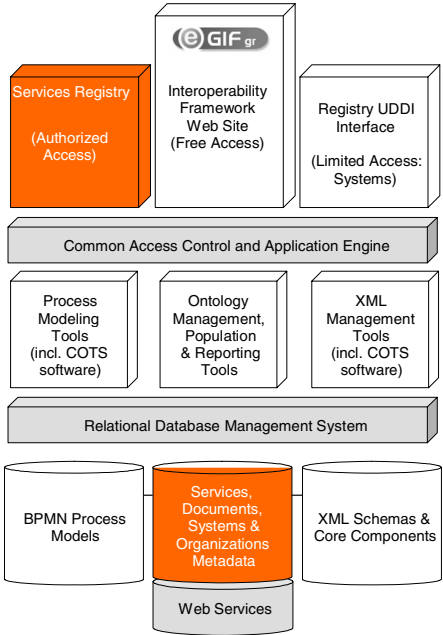

Fig. 3. Platform Architecture

5   Developing the eGovernment Services Registry (eGSR)

The mission of the Services Registry developed is to facilitate the eGS ontology integration into an intelligent and scalable software tool. In order to provide an automated methodological process and data modelling for eGovernment services, an ontology-based intelligent web information system is necessary. For it, the portal implemented as an eGovernment Services Registry (eGSR) offers simple data entry and management, facilitates electronic data automated imports with custom system modules, and also allows different user groups to be aware of the public sector administration and services provision through a wide range of simple, complicated and statistical reports. The target audience of eGS Registry includes the Ministry of the Interior, Public Administration and Decentralization (as the Registry Authorized Monitor), every Public Body that provides any type of governmental services, and ultimately citizens and enterprises as beneficiaries of the registered services.

5.1   Users and Rights

Services Registry has been implemented as an easy-to-use and useful tool in order to capture and manage huge information volumes. From a usability perspective, five types of users can be distinguished:

- Administrator: responsible for the users' rights and roles management, the data updates tracing.
- Super Users: responsible for publishing the adequate information in the Registry, verifying the reliability of the information provided by Public Bodies.
- Public Sector Employees: users who are in charge of providing specific governmental services and they have access only to data related to these specific services and the public body they work for. Except for querying, they have the right of editing and reformulating these specific data. Each update of these has to be approved and confirmed by the super users.
- Registry Monitors: they are senior managers of the Ministry of the Interior, Public Administration and Decentralization, responsible for the healthy use of the Registry and the published data conformity to the related legal framework. Super Users are accountable for the whole system performance and use to the Registry Monitors.
- Citizens /Enterprises: they have free read - access to main data of services, documents and public bodies only for informational and service provision beneficial reasons.

5.2   Data Entry Forms and Reporting

The platform provides standard management functionality (create, edit, delete) for all the main and secondary eGovernment elements, each of which corresponds to menu item. Thus, the items of the elements' management menu are Services, Public Bodies, Documents, Document Fields, IT Systems, Websites and Other Elements such as Projects, Addressees etc. Users can list all the available elements, view the details of any element (meta-data, properties, versioning, constraints etc), search for a defined element and of course create, update and delete an instance. In order to find an element the user is asked to provide search words describing the entity or its properties s/he wants to search for. Authorized users can create, edit and delete instances of the eGovernment elements via details-view web forms. Such a web form of Service Editing is depicted in Figure 4, representing all the meta-data, relations with other elements and attached files, which characterize a governmental service. The attached files can be text-based descriptions, BPMN models, XML files etc.

Furthermore, the Registry offers text-based structured reports and also advanced statistical spreadsheet reports. Users are one click away from producing several types of reports through simplified forms or advanced complicated query combinations. There are three main categories of reports provided by the registry.

- Type A (Main Elements Reports): simple or advanced reports related to the main elements of the Registry, representing requested properties, relations etc. Authorized or anonymous users (with limited data access) can choose among a plethora of criteria and also select the details' level which s/he is interested in.

- Type B (Integrity Control Reports): a specific type of reports which have a notifying role for the integrity and in/completeness of data, relations and constraints stored and represented in the Registry.
- Type C (Sophisticated Reports): complex reports representing indirectly derived results and statistical information crucial for further eGSR data utilization and public sector further development and improvement.

5.3   Technical Implementation

The eGSR (eGovernment Service Registry) portal described above has been done by using the latest web programming techniques. The Web Interface has been developed with ASP.NET 2 web application framework running in integrated mode on Internet Information System 7.0. The DBMS used in the development of this system is SQL Server 2005. SQL Server 2005 has been chosen for its performance and scalability as one of the last trends in database development.

In the pilot operation of the Registry, the DBMS was located at the same machine as the web server was, because the limited user access rate in this first stage. As the access rate has been increased, the DBMS has been set in a dedicated computer. Still though, as the popularity and the overall usage of the portal have exceeded the expected levels, the portal suffered from an extremely low responsiveness. The main reason for this problem was the highly enriched graphical user-interface of the portal that on the one hand it may offer many useful controls and utilities that facilitate its usability but on the other hand slowed down its performance. In order to increase the portal's efficiency, an HTTP compression filter was enabled to make better use of available bandwidth. Data is now compressed before it is sent from the server and compliant browsers will decode the data on the client side. Moreover, there has been a significant effort to configure the Session object in the most efficient way, since it was the main reason that the portal sent too many data to the client. The first step was to create a page adapter that simply returned an instance of the session object rather than the default class which stores the viewstate in a hidden field on the client. Now as requests come in from any type of browser it uses the new adapter which returns a session instance. It this way, the viewstate is no longer stored on the client and therefore the portal's responsiveness was drastically increased.

6   Population of the Registry

Initial Population of the Services Registry has been greatly assisted by the existence of data in electronic form, through the Greek Ministry of Interior and was achieved through the following automated and semi-automated activities:

- Automated import of more than 1,797 public bodies including ministries, prefectures, districts, municipalities and public sector organizations
- Automated import of 1,009 governmental service definitions, with core metadata descriptions and frequency indications, stemming out of 3,000,000 service requests by citizens and businesses during the last year

Fig. 4. Service Data and Meta Data Editing

- Modelling of the initial core 109 governmental services (including all i2010 services and the services amounting to 85% of the yearly service requests) and of the following 360 services and automated import of them in the Registry related to the corresponding service definitions
- Modelling of 1,111 documents with data fields descriptions for 300 of them
- Design of the 90 core XML schemas and automated import of them in the Registry related to the corresponding document definitions
- Modelling of 10 web services and 76 IT systems and portals with their corresponding metadata descriptions

The Registry is now being maintained and further populated with the assistance of engaged public bodies.

7   Conclusions and Future Work

The structured ontological knowledge base and the intelligent meta-data registry presented in this paper introduce a new automated approach towards eGovernment transformation ensuring interoperability by design, rework or change. The common understanding and the explicit eGovernment knowledge ensured by the proposed approach bridge the gap between decision making and technical realization of e-Gov services while supporting all phases (design, configure, deploy, run) in the lifecycle of

e-Gov services. Further benefits of the proposed approach include supporting the management of changes in e-Gov services (preserve consistency, detect inconsistencies, propagate changes, implement changes).

The approach adopted has addressed a number of key issues, such as:

a. Definition of the eGS Ontology and Metadata Definitions for all core elements in the eGovernment domain.
b. Implementation of the web eGSR portal based on the eGS ontological knowledge, as a useful and easy-to-use software semantic modelling tool, with different security levels and targeted multiple user groups.
c. Integration of BPMN models, XML data models into the eGSR.

The initial application of the system, as well as the relevant evolutions from other European eGIF's, are indicating that such new perspectives should be taken into consideration in eGovernment Frameworks from now on [**Fehler! Verweisquelle konnte nicht gefunden werden.**].

Along the Greek eGIF and the eGS Registry a lot of future work has to be done including both organizational and technical tasks, since the proper maintenance and usage of the registry is now the crucial issue. So, efforts will be targeting the following objectives:

• Binding with the Central Governmental Portal for citizens and businesses, so that the registry can merit the appropriate use of anonymous users, beneficiaries of most of the governmental services.
• Initial training of key staff within public bodies for using and extending the registry.
• Engagement of the public servants; more effort is to be put towards encouraging stakeholders to interact with the registry and among themselves, building synergies across the public sector authorities in a truly interdisciplinary way – hopefully leading in the next definition of the registry e-participation functionalities.

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From Cooperation to Cooperability

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Abstract. In many countries of the European Union the system of Local Government is highly fragmented and characterized by the prevalence of small municipalities. By allowing the sharing of resources within an aggregation of municipalities, inter-municipal cooperation could be a solution for some of the problems related to administrative fragmentation. In the paper, after considering the conditions that make the sharing of different types of resources feasible, the concept of cooperability will be introduced in order to describe the non technical aspects of interoperability. Finally, it will be shown how an aggregation of cooperable Local Government organizations can carry out a process of virtual integration among the partners that can help reduce the fragmentation of the system of Local Government without resorting to a forced merger of municipalities.

Keywords: interoperability, virtual integration, inter-municipal cooperation, administrative fragmentation.

1 Administrative Fragmentation in Local Government

According to a widespread definition E-Government can be considered as the use of ICT by the organizations of Public Administration to achieve more innovative forms of government and governance [1]. However, in order to achieve these aims, Local Government organizations must activate processes of technological and organizational innovation that require the availability of resources and specialized competencies that Local Government often lacks.

In many EU Countries the system of Local Government appears highly fragmented and often characterized by the prevalence of Small Local Government Organizations (SLGOs, municipalities with less than 5000 inhabitants). For instance, in Italy the system of Local Government is made up of 8100 municipalities, 103 provinces and 20 regions. Furthermore, 72% of Italian municipalities are SLGOs, little more than 22% have between 5000 and 20000 inhabitants and only about 6% have more than 20000 inhabitants. In such a highly fragmented system of Local Government, it is difficult to ensure the availability of suitable financial resources and, mostly, a widespread presence of specialized competencies for the management of the innovation processes.

Both funding and staffing problems are critical for the SLGOs capability to manage innovation; however, the problem of funding the innovation can be solved thanks to the support of authorities of higher institutional level (the Regional Government or the National Government in the case of Italy), whereas the solution to the issue

concerning the reduced availability of human resources appears to be more problematic since for a SLGO it could be difficult to find, hire and pay people with the required competencies.

In the case of SLGOs, not only does the reduced availability of human resources make the management of innovation difficult but it could also affect the continuity of the delivery of services to citizens and enterprises. For instance, this could happen when within a SLGO a human resource involved in the delivery of a given service fails, also temporary. Usually it is difficult to find already trained human resources that can be easily integrated, when needed, in the processes of production and delivering of services. Moreover, since it is not always possible to carry out a dynamic reallocation of internal resources, the risk of interruption of the service must be considered as a serious risk.

The administrative fragmentation and the prevalence of small municipalities could determine another problem besides the one related to the lack of competencies. Sometimes even in small municipalities highly specialized competencies could be available. However, such resources would risk to be underutilized, just because the small dimension of the organization could not continuously need such complex processes as to guarantee an optimal use of that resource.

From this point of view, administrative fragmentation can cause two sorts of complementary problems:

- lack of resources problem: when SLGOs lack (also temporarily) the specialized (technical and managerial) competencies to handle innovation processes and even to guarantee the continuity of service delivery;
- underutilization of the resources problem: when a specialized competence is available within a SLGO but it is not used in an optimal way due to the organization's scarce needs.

The most obvious way to solve both problems is to reduce administrative fragmentation. However, in those countries, such as Italy, where the municipalities autonomy is constitutionally granted the reduction of the administrative fragmentation cannot be easily obtained by means of a forced merger of municipalities. That is why in Italy, as in other EU countries, the merger policies designed to create single municipalities from several have been combined to policies that support inter-municipal cooperation. [2, 3]

As defined by the European Council, "inter-municipal cooperation institutionalise cooperation between municipalities, and other local authorities close to the community, allowing them to jointly manage certain important services. In broad terms, inter-municipal cooperation may be defined as an arrangement between two or more government organizations for accomplishing common goals, providing a service, or solving a mutual problem. The chief motive for inter-municipal cooperation may be a desire for management effectiveness so that to ensure that local structures are realistic and relevant as far as the exercise of competencies is concerned" [3].

The sharing of resources and specialized competencies within an inter-municipal cooperation can be a solution SLGOs can resort to in order both to manage innovation processes and to establish and maintain high level of quality in service delivery. For this reason, the organizational model defined by the Italian National Centre for Information Technology in Public Administration (CNIPA) for the inclusion of small

municipalities in the spread of E-Government at the local level is based on the cooperation among municipalities for the sharing of resources, through the definition of different forms of inter-municipal cooperation [4].

The relation between the inter-municipal cooperation and E-Government can be considered from two different points of view:

- inter-municipal cooperation represents a solution SLGOs can resort to in order to handle the complexity of E-Government processes by sharing resources and specialized competencies. In this case, the cooperation among SLGOs could be activated even only to achieve economy of scale in the acquisition of ICTs, or to share the resources necessary to implement E-Government solutions, such as, for instance, the implementation of online services for citizens and enterprises.
- the adoption and the widespread use of ICTs implied by E-Government enables more efficient and effective forms of cooperation, even non institutionalized ones, which allow SLGOs to systematically share resources in the management of the administrative processes, in order to improve quality, efficiency, effectiveness, and responsiveness.

Considering E-Government as the adoption of ICT to enable more innovative forms of government and governance, in this paper the second point of view will be assumed and inter-municipal cooperation will be considered as an organizational model that, enabled by ICTs, allows to solve many of the problems related to administrative fragmentation in an innovative and flexible way. Such result will be achieved through the definition of a cooperation environment that enable the sharing of resources among SLGOs, even on a temporary basis.

2   Inter-organizational Cooperation and Interoperability

In broad terms, inter-organizational cooperation is based on the sharing of resources among different organizations; since such resources must be usable by the partners (according to a given policy), inter-organizational cooperation requires some form of interoperability among the organizations involved. Many different definitions of interoperability can be found in literature [5], focusing on different aspects, as shown, for instance, by the following definitions:

1. the ability of two or more systems or components to exchange and use information [6]
2. the ability to exchange data in a prescribed manner and the processing of such data to extract intelligible information that can be used to coordinate operations [7]
3. - the ability of the systems, units, or forces to provide and receive services from other systems, units, or forces and to use the services so interchanged to enable them to operate effectively together;
   - the conditions achieved among communications-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users;
   - the capacity to integrate technology between or among different technical platforms. This form of integration is achieved through information engineering, which translates process requirements into software programs [8].

The definitions (1) and (2) focus on systems inter-connectivity and components inter-changeability [9], whereas the definition (3) adds to the concept of interoperability a different aspect concerning the ability of the partners of the cooperation to operate effectively together. Actually, although systems inter-connectivity and components inter-changeability can be considered as necessary conditions for inter-organizational cooperation, they cannot be considered as sufficient conditions. Generally, inter-organizational cooperation does not concern simply information exchanges among different organizations; rather it concerns the capability of different organizations to operate together in order to achieve a common goal. In this sense, to enable an inter-organizational cooperation some form of organizational compatibility is needed, besides systems interoperability.

This organizational aspect of interoperability has been recognized in many interoperability frameworks defined over the last years. For instance, the ATHENA project [10] considers four layers in the definition of interoperability: applications (data and communication components); knowledge (organizational roles, skills and competencies of employees and knowledge assets); business (business environment and business processes); semantic (support mutual understanding on all layers).

With specific reference to E-Government, the multi-dimensionality of interoperability has been underlined also within the European Interoperability Framework for Pan-European E-Government (EIF) that aims at determining the conditions to make public administrations of EU countries interoperable. In this framework three aspects of interoperability are considered: technical, semantic and organizational [11].

In this sense, both ATHENA and the EIF define interoperability in a way that goes beyond the compatibility of systems and applications, recognizing the need to account for a broader concept of organization compatibility.

The interoperability frameworks defined in literature differ as regards the way they characterize interoperability and the conditions which must be satisfied in order to make systems and organizations interoperable. Yet, despite the differences, the various frameworks seem to share the same general goal: suggesting how to achieve the highest possible level of interoperability.

This goal can be achieved either through the description of maturity models that characterize higher and higher levels of interoperability [12] or assuming a holistic approach in which different dimensions of the concept of interoperability can be integrated. In some cases these dimensions are considered as particular aspects of the concept of interoperability (technological, semantic and organizational aspects basically [10, 11, 13]). In some other cases, instead, the multidimensional character of interoperability leads to the distinction of different concepts that account for different aspects of inter-organizational cooperation (for instance, [14] makes a distinction among connection, communication, consolidation and collaboration, whereas [15] distinguishes among commonality, inter-changeability and compatibility).

However, the maximum interoperability level is not necessarily the appropriate or optimum level for a given cooperation; in a specific collaboration scenario, which can be characterized by a set of contingency factors, lower levels of interoperability may be sufficient [16]. This is what generally happens at a Local Government level where, even if SLGOs could lack the necessary resources for implementing global interoperable E-Government solutions [17], inter-organizational cooperation is widely spread. So, in order to analyze the conditions that can foster inter-organizational cooperation

among SLGOs, it could be more appropriate to start from the general concept of interaction between two or more organizations that cooperate sharing resources than to base the discussion on a given definition of interoperability.

Since the resources that are shared within an inter-organizational cooperation can be of various kinds (financial resources, technological resources, information, services, human resources, etc), it is not reasonable to assume that there is a unique way to manage the cooperation. Rather, both the exchange modality and the conditions that must be satisfied in order to integrate the shared resources in the processes of the cooperating organizations depend on the type of resource involved. To manage the sharing of information among different organizations is, in fact, quite different from managing the sharing of human resources and specialized competencies. Moreover, the modalities of the interaction do not depend only on the type of shared resource; they also depend on which organizational subsystem is the one directly involved in the exchange: the human subsystem, the process subsystem, or the technology subsystem [9]. Finally, when two or more organizations cooperate, they do it in order to achieve a specific goal; the nature of this aim can determine the modalities of the exchange and the conditions that make the exchanged resources usable by the partners.

From the above observations it can be concluded that in order to define what conditions need to be satisfied to make the shared resources usable by the partners of the cooperation, the following elements should be considered [18]:

What: what is the type of resource that is interchanged/shared?
Who: what subsystems of the involved organizations use that resource?
Why: what is the aim of the cooperation?
How: what are the modalities according to which the cooperation can be managed in order to guarantee the usability of the interchanged/shared resources?

Suppose that a SLGO suffers the lack of resources problem because the availability of a human resource involved in the process for delivering a service temporarily fails. Inter-organizational cooperation could provide a solution to this problem through the sharing, even on a temporary basis, of an equivalent resource which is available within another organization. In this scenario, the resource which is shared is a specialized human resource (what). The agents directly involved in the interaction are the offices that in the involved organizations use the required resource (who), while the goal of the cooperation is to ensure the continuity of the service delivery (why). What would make a resource coming from another organization immediately usable within a SLGO is some sort of organizational "homogeneity" characterizing the partners of the cooperation (how). This condition does not concern the interoperability between the technical subsystems of the organizations involved in the interaction; it does not even only concern the standardization of the process subsystem; in this case, in fact, what appears necessary to make the shared resource usable is some form of standardization of the human subsystem.

3   Cooperability

The problem of how to guarantee the interoperability of resources which are not technological resources or information has been widely discussed in the context of joint

and multinational military operations [19] where interoperability is defined as the ability of the forces of two or more nations to operate in synergy in the execution of assigned tasks [15]. Force interoperability is important as it is the means by which units, equipment and personnel, can be taken from various sources and deployed in an effective manner, to achieve a common goal.

Technical interoperability guarantees systems compatibility, that is the suitability of products, processes or services for use together under specific conditions to fulfil relevant requirements without causing unacceptable interactions, and inter-changeability, that is the ability of one product, process or service to be used in place of another to fulfil the same requirements [15]. However, in order to achieve a complete force interoperability besides technical interoperability the requirement of cooperability should be satisfied too, meaning the successful bridging between coalition partners of differences in doctrine, organization, concepts of operation, and culture [20].

Cooperability represents a form of non-technical interoperability [21, 22] which can be defined on the basis of four attributes which summarize different aspects characterizing inter-organizational cooperation [23]: preparedness, that describes the preparedness of the organization to interoperate; understanding, that measures the amount of communication and sharing of knowledge within the organization; command style, that describes the management and command style of the organization; ethos, that concerns the culture and value systems of the organization.

The attributes of cooperability can be used to define the concept of organizational homogeneity, which is the condition that makes a resource coming from another organization immediately usable within a given organization. From this point of view, in order to solve the instance of the lack of resources problem described above through inter-municipal cooperation the condition that should be satisfied concerns the cooperability of the SLGOs involved in the cooperation.

Cooperability and interoperability represent two different requirements for inter-organizational cooperation. As clearly stated in [20], for coalition operations technical interoperability is neither essential nor sufficient to achieve desirable coalition behaviours. It is not sufficient because an exchange of data with an inadequate ability to understand and act on this data does not advance the cause. It is not essential because organization, doctrine and procedures have an impact on coalition operations. They can be designed to make up for a lack of complete or perfect technical interoperability.

This observation raises two problems in designing an inter-organizational cooperation. Depending on the type of the resources shared within the cooperation (What), the organizational subsystems directly involved (Who) and the aim of the cooperation (Why), in order to define the modalities according to which the cooperation can be managed (How) it should be decided: first, which systems have to be technically interoperable and what systems should be integrated organizationally as well; second, whether technical interoperability is crucial for the cooperation or there are organizational means that can support the cooperation also in the absence of technical interoperability.

Both problems can be properly accounted for by taking into consideration a reference model for interoperability in which also the non-technical aspects of interoperability are considered, as, for instance, in the Layers of Coalition Interoperability Model defined in [22] and summarized in table 1.

Table 1. The Layers of Coalition Interoperability (LCI)

Political Objectives	Partners share the same political values and objectives of the coalition.
Harmonized Strategy/Doctrines	Aligned operations are applicable at the strategic level. Cultural and social backgrounds of partners align.
Aligned Operations	Aligned procedures are applicable at the tactical/operational level.
Aligned Procedures	Tactics are aligned across organizations and supported by data and knowledge bases, models and simulations.
Knowledge/Awareness	Common Operational Picture, collaboration tools, harmonized views of operation.
Information Interoperability	Dynamic information mappable between systems, and cause-effect models presenting the information harmonizable.
Data/Object Model Interoperability	Standard data elements and meta data for information interchange.
Protocol Interoperability	Protocols for communication with other capabilities on the network.
Physical Interoperability	Physical connection of a systems to the network and procedures for interchange of information (e.g., tapes, disks).

Although technical interoperability and organizational interoperability (i.e. cooperability) are different concepts, it is quite obvious that cooperation can be maximized by reaching maximum interoperability ratings on all the levels described in the LCI model. The conditions characterizing the different levels can be used to define the properties of a cooperation environment that can be implemented to support inter-organizational cooperation. In the case of inter-municipal cooperation, depending on their more or less restrictive character, the conditions defining the cooperation environment can lead to more or less strict forms of partnership among the SLGOs involved, up to the definition of an Integrated System of Local Government (ISLG), as described in [24, 25].

An Integrated System of Local Government is made up of SLGOs that, on the basis of a preliminary sharing of interests (e.g. increasing both the efficiency and effectiveness of the administration, realization of economies of scale and of scope, management of technological and organizational innovation, etc.), jointly define systematic forms of cooperation based on the appropriate cooperation environment. Within an ISLG, sharing a cooperation environment makes the partner strongly interoperable, not only on the technological level, but on the organizational level as well, up to the achievement of levels of full cooperability among the partners. In this sense, the setting up of an ISLG can be considered as the result of a process of joint technological and organizational innovation.

Although an integrated system is sometimes considered to be more tightly coupled than a system of interoperable components, it is useful to stress that the distinction between systems integration and systems interoperability (up to cooperability) is a question of perspective. What is seen from outside as the result of the integration of different organizations, from the point of view of the partners can simply be a system of independent and strictly cooperable organizations. Actually, ISLG members are not, strictly speaking, integrated in the system, as that would imply an overcoming of their autonomy and individuality; the implementation of an ISLG simply amounts to

the sharing of the appropriate technological and organizational platform, which makes inter-organizational cooperation easier. In this sense, the activation of an ISLG could also be considered as the result of the transformation of an aggregation of SLGOs, that could have been set up in order to achieve immediate results, in a long-term, well-structured cooperation.

The integration among the partners within an ISLG is only virtual and it is determined by the strengthening of the conditions of interoperability (up to cooperability) rather than by a real organizational integration. This has some particularly important consequences:

- each member of the ISLG keeps its autonomy, though it agrees to coordinate its activity with that of its partners and to systematically share resources (of various sorts) with them;
- as the integration is exclusively determined by the adoption of a shared cooperation environment, the activation of an ISLG does not necessarily require the definition of new levels of government (as it happens in the case of institutionalized forms of integration, such the Unions of Communes or the Mountain Communities).

Thanks to these characteristics, an ISLG can represent a solution to the need to overcome administrative fragmentation, in order to achieve the rationalization, the simplification and the reduction of the cost of the system of Local Government. However, to achieve these results through inter-municipal cooperation, the aggregation that set up must necessarily be stable in time. Sharing a cooperation environment means to adhere to the conditions of technical interoperability and, above all, to the cooperability constraints that define it. This can mitigate the opportunistic behaviour of the partners (which is one of the main causes of aggregation instability) and, therefore, can force the stability of an aggregation that turns into an ISLG.

4   Cooperation Environment

As part of the Italian Action Plan for E-Government, CNIPA defined the Public Cooperation System (SPCoop) as a cooperation infrastructure for supporting application cooperation among the organizations of the Italian Public Administration [26, 27].

To adhere to SPCoop a SLGO is required to define a Domain of Services (the services which the organization intends to offer to the other members of the network) and to implement a Domain Port to guarantee the application interoperability, in conditions of security. More specifically, to join SPCoop an organization must subscribe a Service Agreement which contains: the description of the services each member offers to the partners; the description of the interfaces for the exchange of messages; the description of the security policies and requirements; the description of the quality requirements of the services. Since it is based on a service oriented approach, SPCoop requires the organizations taking part in the system to let the partners know only the description of the services offered and the conditions to access them.

SPCoop has been specifically designed to guarantee interoperability up to the level of application cooperation, which covers the four lower layers in the LCI model.

SPCoop does not consider the top four layers (as well as the intermediate level concerning Knowledge/Awareness); in this sense, SPCoop does not account for organizational interoperability.

Nevertheless, by considering different levels of organizational involvement of SLGOs adhering to SPCoop, at least three levels of interaction among organizations can be defined on the basis on this cooperation infrastructure, beyond application interoperability:

1. interactions among organizations which, beyond their adhering to the conditions stated in the Service Agreement for the joining to SPCoop, maintain a complete organizational autonomy.
2. interactions among organizations which cooperate in the carrying out of particular administrative processes constrained by general principles and by organizational conditions shared by the partners. This kind of interaction can be regulated by specific Cooperation Agreements among partners which, beyond the conditions defined for the processes which are the object of the agreement, maintain a complete organizational autonomy.
3. interactions among organizations which implement forms of organizational integration involving processes of mutual adjustment, as required by the concept of ISLG.

Considering the joining to SPCoop as the basic condition for the interaction among SLGOs, the three levels of organizational involvement can be defined by setting out additional conditions which the partners of the cooperation can share. SPCoop already provides the possibility of defining supplementary conditions which can be stated in specific Cooperation Agreements which establish Cooperation Domains.

As it stands, SPCoop allows the Cooperation Agreements to:

- define the processes which are the object of the Cooperation Domain;
- register (publish and qualify) the services delivered by the members of the Cooperation Domain;
- specify security and quality policies for the services which are the object of the cooperation;
- define possible technological measures to adopt in order to guarantee security and quality requirements and to support the full automation of the procedures related to the Domain itself.

However, by tacking into the account also the conditions for organizational interoperability, an aggregation of SLGOs already adhering to SPCoop can decide to share a Cooperation Agreement which forces the partner organizations to enter a process of organizational innovation as required by the level 3 of the classification above. Depending on how strict are the conditions constraining it, such a process can be considered as a process of virtual integration leading to the establishment of an ISLG. More specifically, besides those stated above, a Cooperation Agreement that defines conditions for the virtual integration of the partners must also state ([24,25]):

- conditions concerning the standardization of the processes and the definition of operational standards
- conditions for the sharing of resources of different kinds within the network
- conditions for the monitoring of the activity of the members of the network

- conditions concerning the creation of shared managerial styles and organizational culture
- conditions concerning the definition of a shared system of values and strategies
- conditions concerning the adoption of a shared organizational ontology, terminology and enterprise model

Starting from this observation, based on SPCoop a cooperation environment supporting interactions among SLGOs (up to cooperability) can be defined as in figure 1:
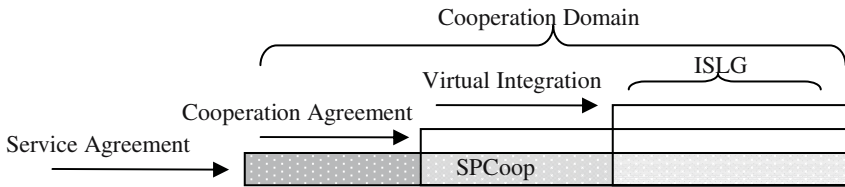

Fig. 1. A three-tiered organizational architecture for the cooperation among SLGOs

5   Conclusions

The paper focused on the cooperation among Small Local Government Organizations as a means to overcome some of the problems related to administrative fragmentation through the sharing of resources of various kinds. Since specialized competencies are the most problematic resources for SLGOs, the paper considered the conditions that can make SLGOs interoperable also with regard to the sharing of this kind of resources.

More specifically, in the paper it has been claimed that in order to become highly interoperable (up to cooperability) the members of an aggregation of SLGOs must enter a process of mutual adjustment, leading to the establishment of an Integrated System of Local Government. The virtual integration of an aggregation of SLGOs within an ISLG could help reduce administrative fragmentation, without having to resort to some form of forced merger of municipalities and without requiring the delegation of competencies as regards policy-making.

The virtual integration of the partners within an ISLG is enabled by the sharing of a particular cooperation environment in which the conditions for technological, operational, organizational and regulative interoperability are integrated.

In the paper it has been showed how such conditions could be implemented in a cooperation infrastructure like the Italian Public Cooperation System, defined as part of the Italian National Action Plan for E-Government. As it is currently defined, SPCoop does not consider interoperability conditions besides those required for application cooperation. In order to integrate in SPCoop also the conditions for inter-organizational cooperability the paper suggested an extension of this cooperation environment, thus leading to a three-tiered organizational architecture for the cooperation among SLGOs.

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Challenges of Government Enterprise Architecture Work – Stakeholders' Views

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Abstract. At present, a vast transformation within government systems is executed towards electronic government. In some countries, this change is initiated as enterprise architecture work. This paper introduces results from an empirical study on different stakeholders' views on enterprise architecture development within Finnish state government. The data is gathered from 21 interviews accomplished during spring 2007 among participants of the Interoperability Programme of Finnish state administration. The interviewees represent different sectors and levels of Finnish government and IT companies. On the basis of qualitative data analysis we discuss challenges of enterprise architecture work in the context of state government. The key conclusion is that the governance level of enterprise architecture needs to be adequately adjusted and enforced as a tool for the development of business operations.

Keywords: State Administration, Enterprise Architecture, Interview Research.

Track: Transforming Government.

1   Introduction

The development of the contemporary information society typically includes the construction of electronic services into the service systems of public administration. In fact, both private and public organizations have already during three decades increasingly developed and decentralized customer-oriented functions, which are based on information technology [1]. At present, public administrations all over the world promote ambitious and costly e-government programmes to provide electronic access to government services [2] The development of information and knowledge intensive electronic services within these new types of service systems have generated action models that often regard solely information and communication technologies (ICT), in particular, the integration of electronic services into the everyday lives of people, as the basic assumption of the development work.

Consequently, e-government approaches have not been able to solve many organisations' concern how to utilise ICT to its fullest strategic extent. There are difficulties in the practice of e-government [3], with government targets reported as vague [4], and many e-government initiatives described as chaotic and unmanageable [5]. One solution has been to initiate an enterprise architecture (EA) program. EA is

seen as a comprehensive approach, for example: "*enterprise architecture is a coherent whole of principles, methods and models that are used in the design and realisation of an enterprise's organisational structure, business processes, information systems, and infrastructure.*" [6] Further, Enterprise architecture is used to describe how different elements in an organisation – systems, processes, organisations, and people – work together as a whole [7]. By identifying, structuring and categorizing these elements, EA can increase the potential for cross-public sector reuse and reduce duplication and hence reduce costs. Both business enterprises and governments all over the world have recognised the special value of EA [8] . As well as e-government, EA promises results in better, faster, and cheaper information technology, which satisfies organizational goals and objectives. Compared to e-government initiatives EA programs are often more holistic approaches that intertwine and focus disjointed e-government projects to increase cross-public sector reuse and reduce duplication. Governments usually have several independent e-government projects, which may have limited coherence and remain largely uncoordinated [9]. EA can serve as an umbrella for explaining the relationships among the projects and managing change instead of exclusively concentrating to implement ICT.

EA as a holistic development approach aiming to interconnect different functions, information processes and systems as well as technologies is seen to have many benefits. Especially, it is seen an approach that supports communication, decision and change management in the organizational entities under development [e.g. 10]. In taking EA into use as a holistic development tool for e-government, it is of utmost importance to take into account the views of the stakeholders involved. For instance, when developing enterprise systems, it is necessary to notice the stakeholders' views [11]. From an information-legal basic rights viewpoint, the most pivotal issues of catering for the stakeholders concern the right to receive information, the right to communicate, the right to free information, to exchange information freely, and the right to information sovereignty [12]. Thus, when using EA as a tool for e-government, attention should be paid to its informativeness, especially how the stakeholders understand EA in the context of developing e-government.

However, there is little research that discloses how the stakeholders actually understand EA as a tool for development work of e-government. In this paper, we introduce results from an empirical study concerning different stakeholders' views on Enterprise Architecture development, in particular, the stakeholders' views of the challenges that they see in the EA work initiated as an Interoperability Programme of Finnish state administration. In the following we first we depict the research setting and method. Second, we present the results as stakeholders' perceptions of the challenges of EA in e-government. Finally, we state the conclusions and topics for future research.

2   Research Method

According to its aim to understand different stakeholders' views in particular organizational context, the study merges with the principles of interpretive research that is seen to produce deep insights into human thought and action [13]. An interpretive analysis was carried out with data from semi-structured, in-depth interviews. The interviewees were asked a written informed consent, and the questions were asked in a manner that excludes interviewer bias [14].

The interview themes and related questions were derived from an underlying theoretical EA framework developed for Finnish state administration. The framework consists of four generally known EA viewpoints:

- Business (e.g., clients, organisation, stakeholders, services, processes)
- Information (e.g., strategic knowledge capital, vocabulary)
- Information systems (e.g., information system portfolio, systems' life-cycles)
- Technology (e.g., technology and standard policies, model architectures)

These issues are placed within three levels in the framework. The highest is the level of state administration, which is the top level of decision making. The second level is the level of administrative sector, which includes independent decision-making bodies under state administration level. The lowest level refers to civil service department level. This structure was implemented in this study by selecting interviewees from each level. The interview questions concerned the respondents' views of current and future condition of state EA. These levels form the basis for interconnections between the different sectors in that the level of state administration operates in a cross-sectional manner, and thus is able to delegate cross-sectional tasks to the lower levels. In this way also the participants from the state administration level possess essential decision making power.

The data is collected from 21 interviews accomplished during spring 2007 among participants of an Interoperability Programme of Finnish state administration. At the time of the interviews, the Programme was just started, and was in its planning phase. The interviewees represent stakeholders from different levels and also sectors of Finnish government and IT companies. Their concern related to the development of EA varied according to their occupational position (Table 1). The selection of interviewees was based on purposeful sampling [15] in order to capture variation in the data in terms of both assumed information intensiveness and stakeholder population. The interviewees consisted of 11 state employees and 10 IT company employees. Six of them were female and 15 were male. Purposeful sampling together with the number of interviews is regarded to provide for saturated analysis of the information available [e.g. 16].

Table 1. Interviewees by occupation, organisational level, experience in EA, and number

Occupation	Organisational level	Experience in EA (yrs)	No
Administrative counselor	State administration	25	1
Chief Secretary	State administration	10	1
Operations Manager	State administration	7	1
Vice Director	State administration	30	1
Senior Lawyer	Administrative sector	1	1
Information Specialist	Administrative sector	7	1
Senior Adviser	Administrative sector	4	1
Data administration manager	Civil service department (city)	2	1
Data administration manager	Civil service department	15-30	3
Consulting Manager	IT company	4	2
Chief Consultant	IT company	4-10	4
Consultant	IT company	1-10	3
Director, Business Operations	IT company	10	1

The transcribed interviews were analysed with the aid of ATLAS.ti –software. During analysis an interpretation of the interviewees' utterances was carried out by iterating between the interdependent meaning of parts and the whole that they form [13]. In this way the whole data was the source of the results, which indicate the various meanings that the respondents assign to EA. In the following, the citations from data are selected on the basis of representativeness within data.

3 Challenges of Enterprise Architecture Work

The most pivotal challenges emerging from the data during analysis are divided into three main categories comprised of the following subcategories:

1. Implementation ability and governance
- Shared understandings
- Implementation ability
- Business and IT alignment
- Governance
2. Structure of state government
- Legislation
- Professionalism
3. Advancement of interoperability
- Shared IT infrastructure
- Crossing the administrative sectors
- Understanding the influences of technology and information systems

3.1 Implementation Ability and Governance

According to the interviewees there are several challenges in EA implementation in state government. These challenges focus on shared understandings in the development of new services, implementation ability, business and IT alignment, and governance.

3.1.1 Shared Understanding

Employees of state government feel that developing electronic services is challenging, for instance, there are conflicts in focus and road map:

Researcher: "Are there any new services that your organization could produce?"
Interviewee: "Internet services are for us, I think, a big challenge…that those are really services that work in the net…we have a lot of conflicting thoughts about how to proceed in these matters and also discussion about focus areas…but as far as I can see there is a lot of potential for development…at the same time these singular processes are changed into Internet services and the information from these should be recovered."

Transformation of traditional services into electronic services, used by the customer via Internet, is seen difficult. There seems to be a need for a strategy discussion in the level of management in the organizations. Without a shared understanding it is not possible to modernize the service production in a holistic manner.

3.1.2 Implementation Ability

If the strategies developed in the government are not taken as the foundation of operations, their governance and implementation ability remain inadequate. This is partly due to the funding mechanisms that are founded on fixed-term projects:

"There is a huge amount of paper produced in state government…but their governance or this kind of – is it a problem of implementation. I have certainly read ten different strategies of state government strategy and implementation plans, implementation programmes within the past ten years –what fine papers, but the governance and implementation ability need to be changed…they are written directly to the bookshelves…they have fixed-term funding…they do as told and then they are left into that."

There is a danger that EA implantation is insufficient when there is a lack of mandate and employees. For EA work to be successful, collaboration and communication between management and operational personnel is needed while constituting the organizations strategy and practices [17]. Lack of strong leadership and coordination of development work in state government are recognized as essential obstacles in service modernization [18]. The interviewees hoped that the operational personnel and management would commit themselves in a new way to service production. This can not be done merely in the level of the IT function:

"I do not see that management of IT function is the problem in this because they have for a long time been doing this basic work –it is more about chief secretary, top management and also in municipalities then...development personnel's…this kind of getting them involved…Better planning of operations with the operational personnel."

3.1.3 Business and IT Alignment

An IT expert of EA work sees it challenging to get the government EA as a governance tool:

"One very important thing is that how this architecture work -which has now just begun and is an persistent thing, is get to be ongoing and in the other hand…will be spread there as a governance method for these organizations…Architecture is a governance instrument which then guides us towards these principles we want to do or faster service, better service, more proactive service."

EA includes a governance model which describes principles for EA management and maintenance through organizations steering processes. Finnish government's EA work takes into consideration the whole organization and its functions through strategic management and utilizes possibilities provided by IT. EA is a practical tool for business and IT alignment [17]. According to the data EA can be used to direct all kinds of development projects in different situations. The challenge is to make people see EA as a tool for overall development:

"...to me this matter is important because if one uses enterprise architecture only as a tool - though it is useful as a method and description device, and even as a mental model it is ok - but then it only has an instrumental value instead of becoming, not necessarily a world explanation, but yet sort of framework for holistic development,

and only then one can get the whole effectiveness out of it...so it becomes the basic framework on the basis of which a project can be built regardless the situation."

3.1.4 Governance

Interviewed IT function managers state that concrete governance for the IT function is a requirement for EA. According to them given EA principles and strategies do not serve the work of ministries and departments if they are open to interpretations or loose:

"There should be sufficient steering…clarity and governance…now there is a fear that it…will be so loose that it does not have enough governance…it [EA strategy] remains so ambiguous then that it does not sufficiently guide and in a way does not serve then…when we are there with the statistics management discussed about the matter so there affirmative is expected that it really would steer our work and the architecture…would be that kind that you would be able to catch it and it would steer the work…"

This is a challenge for government EA work. The EA and its principles need to have a governance power but at the same time they can not be too restrictive:

"…it should be adequately steering that it would steer the practices together…coherent practices in long-term…in the other hand is should enable it that within the strategy it is possible to compete different suppliers…"

In the long-term coherent practices are seen as a very important goal. Interviewees feel that opportunity for competition of IT suppliers is an advantage and they hope that EA strategy will support in arrangement of competitions. Success factors might be open communication and stakeholder originated development [19].

3.2 Structure of State Government

The complex governance and organizational structure of state government was seen as a challenge from various viewpoints. EA work should be planned in a way that it takes existing structures into consideration [20].

3.2.1 Legislation

Interviewees see a tension between the legislation regarding state government and administrative sectors. This tension is visible also between the national and international legislation. EA is one solution for unifying the national legislation, service and IT solutions.

"For example…Ministry of Interior has build a system for police administrations information management in which…steering features is efficiency of police, international contacts of police and support of police work…then it is said that for rational reasons you need to transfer to common architecture, common data level solutions and common service solutions. Then there comes a conflict –this is not a conflict of legislation but this is a conflict of systems…Customs is a good example…Customs is not officially business of Finnish state government and it is a system owned be the EU…and we are a national department of Brussels. EU forms a joint customs area –it has one common customs legislation and customs is lead from Brussels…"

3.2.2 Professionalism

The work within state government has traditionally been organized by professions. This might make it more difficult to question or change the work practices:

"…these kind of professional services…state government –the structure is explained by this kind of professionalism in a great extent…juridical system is owned, managed and run by lawyers and they do not take criticism from others… National Land Survey of Finland is owned by surveying engineer and they do everything by themselves…doctors they are...equally big trouble…so this kind of cohesion of professions and unwillingness to see any other possibilities for organization…"

Interviewees anticipate that the employees of government wish to maintain the current organization structure, since professionalism constitutes an obstacle for creating new insights. The data shows that people are afraid of moving support functions away from the authority of own department, because, they think that it influences the organization of the substance functions. This threat might be genuine, provided the changes are not made in a controlled manner. Finnish government's EA work aims at enabling controlled strategic changes in management control and it offers development models and methods and tools for controlling the changes. The challenge in EA work is altering work procedures, conceptions and beliefs. Emergence of conceptions that are professionally bound reflects the need for encountering and consolidation of the organizational cultures [21]. This seems to be necessary also in government EA work. It is challenging to motivate the change of work practices towards new ways of working.

In the state government data exchange has traditionally been paper based. The transition to electronic data exchange is a massive change, in which, according to the interviews, all employees are not ready or willing:

"We are still pretty much in the pattern that rationalizing information management and processing by technique is…quite in the beginning…Council of State works fine as paper-based and management can have collected information without any problems regardless of these systems… motivation level for [EA work] is reduced by that the management do not need these development steps for themselves."

3.3 Advancement of Interoperability

EA is one solution for state government's integration and interoperability challenges [9]. Interoperability is an ability of information systems and processes supported by them to share and exchange information [22]. However, the interviewees see interoperability issues as challenging.

3.3.1 Shared IT Infrastructure

Interoperability of services and information systems can be improved by shared infrastructure for information systems and technology. According to interviewees this supports common practices for financial and human recourses:

Researcher: "What the corporate governance mean in practice?"
Interviewee: "…common financial steering, common human resources management to a certain limit and now…building common IT for this production instrument, for improving its steer ability and interoperability and efficiency…for improving the

effectiveness of corporate governance common IT infrastructure is a fundamental question…"

Interoperability of the IT infrastructure is seen as the core of EA work. However, interoperability is a wider goal than that. Common IT infrastructure can be the beginning for electrification of services. This was accomplished successfully in Canada by accommodating operational needs of administrative sectors and departments [23]. It would be beneficial if IT infrastructure could be developed subordinate to the business vision and strategy.

3.3.2   Crossing the Administrative Sectors

Interviewees participating in IT strategy work in the administrative sectors see development challenges in crossing the administrative boundaries:

"IT strategy work in administrative branches…there has explicitly been an intention to consider this administrative branch's…key transformation factors and needs and principles…how much do we have integration needs in this branch…mostly in regard to information architecture…but also outside this branch…I wish that the State IT Unit would solve those problems we want to solve at the moment…besides in our department also in the whole administrative branch and as far as I can see in the whole state government…"

There are integration needs in all levels of state government. The need for crossing the administrative sectors unfolds frequently in the interview data. The government EA work is hoped to contribute to these matters. Integration of single information systems into larger service entities is in the agenda of many Western countries for modernizing state government, but this kind of cross-governmental development work is complex and challenging task [24]. In addition, there also are many questions related, for example, to data protection and security that need to be addressed. It clearly is challenging to achieve extensive interoperability. Therefore, the structure of state government often impedes the success of EA work [25] [26].

3.3.3   Understanding the Influences of Technology and Information Systems

Interviewed top level decision makers see that knowledge of technology is deficient in some regard:

"…also managers should know about these issues about information systems, they are business processes and there is normal decision making power related to them and…operations which need to be equally evaluated as the same as when we renew some other work practice."

Management's ability to understand the influences of technology and information systems and their implementation is essential in order for them to make decisions concerning IT. This is a challenge. With EA it is possible to examine how to take best advantage of technology and its abilities in rationalizing [27].

4   Conclusions

This article discusses the challenges of national EA work in Finland perceived by the stakeholders who participated in the state's Interoperability Programme in spring

2007. The results indicate that, according to the interviewed stakeholders of state EA work, essential challenges are, first, an implementation ability and governance. This is seen challenging in terms of shared understandings, implementation ability of EA, business and IT alignment as well as governance. Second, structure of the state government is forming challenges to EA work. Especially legislative boundaries and socially rooted structures in the form of professionalism are seen to hinder EA work. Third, advancement of interoperability within the whole state government is a challenge. Here the lack of shared IT infrastructure is one obstacle. Another challenge is seen in the opportunities to cross the administrative sectors, particularly by service processes. Finally, a challenge for the success of EA work is the insight into the impact of technology and information systems within state government.

The results reflect a similar need for creating an overall strategy for the state government that has arisen in different countries [28]. Methods for this are, for example, centralization and integration of services. The departments of state government are encountering the dynamic environment that increasingly demands efficiency [17]. This requires interoperability of business functions, information systems and technology. This challenge arises from the data. Business and IT alignment enables the organization to utilize its information resources in achieving business goals. In this kind of situation department's information systems support and they are supported by the department's strategy [17]. According to the stakeholders, information resources can be utilized in co-operation use in various ways but this requires investments in vocabularies and ontology services. EA is a practical tool for increasing and ensuring the interoperability of business, information systems and technology. In the data this is visible in cross-governmental electronic services which are possible via shared technology architecture, centralized registries and portals.

It seems that government EA work requires changes in work practices and investments in change management. This is a challenge but at the same time an opportunity. EA is one tool for public service modernization. The interviews show that EA work is weighted with great expectations which need to be answered in the future. On the basis of the data we recommend the following:

1. The governance level of EA needs to be leveraged. EA should form the ground for business driven development and decision making.
2. EA needs to be a tool for business driven development. This requires the involvement of general management and people who participate in the development of substance functions.

The level of governance needs to be suitable. If governance is insignificant, it diminishes the benefits that could be achieved in co-operation, better services and lower costs. Too strict governance may lead into diminishing of innovativeness and initiatives which may reduce modernization of public services and government's structures. One part of the governance is EA governance model. With it EA can be linked in the state government's business and financial processes. Governance model includes tools for EA governance and maintenance. The usage of these is needed for keeping the EA current and able to support the business functions. If EA work remains in the level of information management the maximum benefits are not reached. In that case, for example, integration of information systems is done without of holistic reorganization of service structure.

In general, various challenges of EA work are widely known; however, there are not yet many solutions. There is also a lack of empirical studies concentrating on how to successfully use EA especially in public sector reforms. In the future, a follow-up study concerning the stakeholders' views on state EA will be carried out. Then the topics emerging as essential in this first interview study will be elaborated. It is essential to further clarify the stakeholders' views in order to incorporate general management and people who participate in the development of substance functions to the EA work. In this way it is also possible to unveil the potential strategic knowledge capital that the stakeholders have regarding eGovernment.

Acknowledgments

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Introducing a Public Agency Networking Platform towards Supporting Connected Governance

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Abstract. Connected governance constitutes the current trend regarding the provision of electronic governmental services. In the connected governance paradigm, public agencies share objectives across organizational boundaries, as opposed to working solely supporting autonomous portals in the e-government era. The establishment of connected governance poses new requirements, such as cross-organizational connectivity as well as back-office to front-office integration. Towards supporting this concept, we propose a Public Agency Networking Platform (PANP) facilitating personalized cross-organizational services, based on the concept of life events which represent human situations that trigger public services. The key feature of the platform is the simplification of the process execution workflow, as life events are accomplished through a user orchestrated process combining the functionality of discrete public agency applications. Emphasis has been laid on the citizen data protection by adopting a profile mechanism that enables the citizen to administer his/her own data loaded in his/her profile.

Keywords: Connected Governance, Cross-organizational Services, Personalization, Citizen Profile, Life Events, Governmental Portal, Privacy.

1 Introduction

E-government should significantly contribute to government transformation process towards a leaner, more cost effective government. In particular, personalized electronic government services are supposed to give public organizations tremendous possibilities for their e-government strategies [1]. Fully personalized e-government portals, for example, should provide citizens with exactly those services they need, increasing citizen satisfaction levels, making communication between governments and citizens more effective and efficient while reducing bureaucracy. In a move towards efficiency many countries are in the process of integrating e-government policies and strategies. The concept of "connected governance" serves towards this direction. Derived from the whole-of-government approach [1], it aims at improving cooperation between public agencies as well as deepening consultation and engagement with citizens. Behind the concept of connected governance is a systematic approach to collect, reuse and share data and information [1]. For this concept to be

accomplished, numerous e-government interoperability frameworks have been proposed in different countries, such as UK e-Government Interoperability Framework [2] and NZ e-Government Interoperability Framework [3].

The existence of a "central portal" acting as a "single access point" for all services, either cross-organizational or not, is essential for the establishment of the connected governance paradigm. The way existing services, provided by independent public agencies, are integrated and coordinated to fulfil citizen requests is also an important issue. To this end, an approach has been proposed on the concept of "active life event portal" ([4], [5], [6]). Life events constitute a grouping mechanism of public e-services according to citizen needs. In particular, each life event corresponds to a workflow composed by existing e-services. In such a case, a number of issues mainly related to legal or governance-based obstacles may arise. Such issues mainly concern the transfer and processing of the citizens' data among different public agencies and the way the cross-organizational processes are orchestrated and by whom. Towards this direction, this paper proposes an alternative approach supporting personalized cross-organizational services, while focusing on citizens' awareness and acceptance over the overall workflow corresponding to a life event. Our approach is based on a platform accommodating personalized information produced by public agencies with the explicit consent of the citizen. This constitutes an alternative implementation for personalization in the context of e-government that ensures authorized usage of citizen data.

The proposed platform resembles a "virtual representative" for citizens using a profile mechanism. The platform utilizes the life events concept as described in numerous public sector portals ([7], [8]). Furthermore, it facilitates the maintenance of private citizen's folders containing all citizen-related data used during service request processing. The profile interacts with the public agencies through the *Public Agency Networking Platform (PANP)*, described in the paper. The platform should not be conceived merely as a way to facilitate the implementation public e-service portals, but rather as an alternative way of electronic interaction among citizens and public agencies. Hopefully, the platform could contribute to the vision of the connected governance and the creation of a public agency networking system.

This paper is organised as follows: Section 2 provides some background information regarding the transition from e-government to connected governance. Section 3 explains how connected governance can be supported. The functionality and architecture of the suggested Public Agency Networking Platform is presented in section 4, while section 5 discusses an example to illustrate citizen-government interaction through PANP. Conclusions and future work reside in section 6.

2   Background – From E-Government to Connected Governance

The term e-government or simple "e-gov" concerns the use of information and communication technologies (ICTs) to improve the activities of public sector organisations, focusing on services provided electronically (that is via the WWW) to the public. There are three main objectives of e-government: a) improving government processes, b) connecting citizens and c) enabling seamless external interactions between Public Agencies (PAs) at different levels (for example local, federal, European). Access to

supported e-services is provided through e-government portals, either supporting an individual public agency or more commonly acting as a "single access point" for all e-services provided at local or federal level, such as DirectGov portal [9] or SIMPLEX program [10].

DirectEGov is the e-gov portal of the UK public sector. It is considered as one of the most sophisticated e-gov portals in Europe [1] in terms of integration. It provides "public services in one place". It usually redirects the user to the site of the governmental agency in charge where an on-line form provides the necessary information. The SIMPLEX program is a transversal instrument that groups and assembles simplification initiatives with significant impacts in terms of improving the quality of the relationship between the Public Administration, citizens and businesses in Portugal [10]. One of the key projects of SIMPLEX program is the Citizens Portal. It aggregates many e-services from different public agencies and facilitates their grouping and easy access.

The phrase "e-government" has been related to a continuous effort for public sector modernization since the 90's, but nowadays it is losing its appeal as a slogan or concept. As reported by the Organization of Economic Cooperation and Development (OECD) [11], "e-government initiatives in recent years are focusing on issues, such as how to collaborate more effectively across agencies to address complex intra-government problems and how to enhance public satisfaction and increase e-service usage". Public agencies have traditionally been compartmentalised. As governments are realizing that continued expansion in e-services is not possible without some kind of integration between individual public agency information systems, the increasing importance of cross-organizational coherence has clearly shifted the focus towards managing, integrating and coordinating government e-services [1]. Whereas the phrase "e-government" stipulates the need for developing e-services, the concept of "connected governance" [1] indicates the provision of e-services at the front-end supported by integration, consolidation and innovation of cross-organisational government processes at the back-end to improve service delivery. The distinguishing characteristic of connected governance is that public agencies share objectives across organizational boundaries, as opposed to working solely supporting autonomous portals in the e-government era.

3 Supporting the Concept of Connected Governance

Connected governance is built upon the concept of interoperability, that is the ability of public agencies to share and integrate information using common standards [1]. The key features of connected governance are successful service innovation and multi-channel service delivery. Service integration depends on strategies, policies and architectures that allow data, IT systems, business processes and delivery channels to interoperate. If delivery channels and back-office processes are integrated, different service delivery channels can complement each other, improving the quality of both services and the delivery to government and citizens simultaneously [12].

As already mentioned, the establishment of connected governance presupposes the existence of a central portal acting as a single access point for all services, either cross-organizational or not. Existing services provided by independent public agencies

should be integrated and coordinated in a seamless manner in order to fulfil citizen requests. Fulfilling citizens' requests implies that their needs have been effectively identified. However, government authorities have their own view of the world providing public e-services either through the central portal or alternative delivery channels. Most existing e-gov portals, as DirectEGov, group provided services based on areas of interest, to facilitate the citizen identifying the services that he/she should use to satisfy a particular need. An alternative approach, as stated earlier, is based on life events. A life event is defined as "a situation of a human being that triggers public services" [6], such as "fill an employment application" or "getting married". In both cases, the citizen should initiate the corresponding services, which may be executed in the relative public agency individual site, as in the case of DirectEGov portal [9].

The active life event portal approach ([4], [5], [6]) facilitates the representation of life events as workflows composed by pre-existing e-services. In such a case, the citizen initiates a predefined workflow instance, corresponding to the life event describing his/her situation, e.g. "fill an employment application". Such an approach promotes the concept of connected governance. Numerous ongoing research efforts focus on the way individual services are composed to workflows triggered by life events. Some of the current EU projects towards this direction are:

Advanced eGovernment Information Service Bus (eGov-Bus) project (www.egov-bus.org). According to project synopsis, the eGov-Bus is a dynamically adaptable information system supporting life events experienced by the citizen or business serviced by European government organizations. Governmental portals are transformed into virtual agencies, which cluster functions related to the customer's everyday life, regardless of the responsible agency or branch of Government. Life event workflows are defined by the 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). SemanticGov project utilizes Service Oriented Architectures paradigm and Semantic Web Services technology to automatically compose life events 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) [4] and uses concepts and technologies related to Web Service Modelling Ontology. The PEGS infrastructure includes the service requestor, the front-office application, the application layer and service providers. The application layer includes such modules as Service Discovery, Service Composition, Data mediation, and Process Mediation [5].

OneStopGov project (www.onestopgov-project.org). The project aims at specifying, developing and evaluating an active life-event oriented, integrated, interoperable single sign-on platform for online one-stop government. This platform is accompanied by a coherent framework for realising and exploiting online one-stop government at all levels. Active life events are modelled in Business Process Modelling Notation (BPMN). Their definitions are expressed in Business Process Execution Language for Web Services (BPEL4WS). The public services are specified in Web

Service Description Language (WSDL) and handled by a Universal Data Description Interface (UDDI) [6].

The main goal of the above projects is to facilitate government service delivery to citizens in an automated and seamless fashion. The citizen has a "black box" view of each life event, since he/she is informed about the outcome without having any notion of individual workflow steps. Thus, a number of issues mainly related to legal or governance-based obstacles may arise concerning the transfer and processing of the citizens' data among different public agencies and the way the cross-organizational processes are orchestrated and by whom. Legal obstacles refer to collecting and storing data on user characteristics. In many countries, the transfer and processing of citizen's data between different agencies of the public sector is prohibited by the legislation, thus making cross-organizational cooperation unfeasible, even though such effort is technologically safe. Governance-based obstacles relate to the question "what department, administration, ministry, and ministers are responsible for what?" [13]. This question is particularly relevant when implementing cross-organizational services that combine several processes of different public agencies. Where should each service be executed? Who is responsible for the citizen's data exchanged between public agencies?

To overcome such difficulties, we propose that the citizen should obtain a "white box" view of the services provided to him/her through the central portal. That is, the citizen should be able to monitor individual steps of the workflow triggered by each life event, give his/her consent before initiating each individual service offered by different agencies and be actively involved in where, how and for how long individual data will be stored while his/her request is being processed. Such an approach may increase citizen's trust to the provided services [14].

An additional aspect of connected governance is the enhancement of public satisfaction and increase of e-service usage. A way to augment citizen satisfaction from government services is the provision of personalization capabilities. The objective of a web personalization system is to "provide users with the information they want or need without expecting from them to ask for it explicitly" [15]. To achieve these objectives, web personalization process usually consists of (a) the collection and pre-processing of Web data, including content, structure, usage and user profile data, (b) the analysis and discovery of correlations between such data, and (c) the determination of the recommendation methods for hyperlinks, queries, products and user interface [16]. The means to analyse the Web data include demographic filtering, collaborative filtering, content -based filtering, case-based reasoning, rule-based filtering, Web mining and some hybrid approaches [17]. The main idea behind these algorithms is to compare the navigational behaviour of an active user with previous users in order to cluster similar users and detect user patterns.

Personalization, in the context of the connected governance paradigm should be revised. The user profile should provide personalized dynamic information about the public agencies in question with the explicit consent of the user. None of the information that the profile contains should be shared with the recommendation engine for the necessary statistical reasoning, even thought this could be done anonymously. This notion is a way to prohibit the privacy violation and enhance the trust between the platform and the citizen. Furthermore is compliant with the Directive 1995/46/EC on Data Protection (section VIII) and the Directive 2006/24/EC on Data Retention (Article 7). The citizens,

through their profiles, should feel that they are the exclusive administrators of the information that is loaded into the profile. However, as discussed in [13] and [18], there are obstacles towards the personalization of electronic services provided by the public sector. These obstacles concern both the citizen and public agencies and are analytically discussed in [13]. Some of the most important ones concerning the citizen are: a) access mechanism of services, b) control the user has over the whole process, c) privacy of sensitive user data, d) trust and e) acceptance of the delivery channels and the back-end processes. Some of the most important ones concerning public agencies relate to legal, process-based, financial, governance-based and technical issues. Building a connected governance platform overcoming most of the identified obstacles should lead to a more personalised citizen view of electronic services offered, which would consequently enhance public satisfaction and increase e-service usage.

4   Public Agency Networking Platform

The aim of our effort is to suggest an alternative approach for connected governance focusing on personalization and citizen acceptance issues. Thus, a "white box" view of the provided services is adopted. To this end, we propose an integration platform, named *Public Agency Networking Platform (PANP)*, ensuring a single sign-on access to cross-organizational services in a personalized fashion based on life events. Cross-organizational life events are accomplished through the citizens' active involvement, thus enhancing citizens' trust in the platform. Another key feature of the platform is the modular design which enables the use of the platform in every administrative level (local, federal, European). In the following, PANP proposed functionality is analytically described.

Through PANP, citizens are able to create a profile and progressively arrange his/her private space included in the profile by integrating applications specifically implemented for this purpose by public agencies. Public Agency applications can be considered as the main execution component of the platform and are executed within PANP. They act as gateways between the citizens and the public agencies. They can be installed and uninstalled in the citizens' profile, with his/her consent, in a modular fashion. The profile can be considered as a private virtual folder where citizens' data from the government agencies can be stored either permanently or temporarily, e.g. during a life event processing. Special effort has been made so as the platform to be compliant with the Directive 1995/46/EC on Data Protection (section VIII), the Directive 2006/24/EC on Data Retention (Article 7) and the Directive 2002/58/EC on Privacy and Electronic Communications. In the conceptual level, the owner of the profile and the data it contains is the citizen himself. In the physical level, the platform should be hosted by a commonly accepted and independent authority, constitutionally and legislatively responsible for the protection of citizens' personal data. Additionally, it is up to the citizen to define whether his/her sensitive data will be permanently stored within the platform or be acquired in real time from the public agencies, upon citizens' log-in, and stored in a temporal session.

Citizens have full control on all the data and applications stored or used in their profile. In that sense, the accomplishment of a life event is user-orchestrated. To accomplish a specific life event, one or more public agency applications may need to be integrated in the profile. The communication between them is accomplished by the information they obtain or store within the profile. Thus, each public agency application

has no notion of the existence of others, while the workflow corresponding to a single life event is formulated based on data exchange performed within the profile, fully controlled by the citizen. A recommendation mechanism assists citizens to identify the proper applications needed to accomplish a specific life event. Citizens can be authenticated by a central authentication mechanism in PANP. However, user authentication may be independently performed for a specific application either via standard login/password fashion or using electronic signature stored in a certificate, if additional security is needed by the corresponding public agency.

It is worth mentioning that cross organizational interoperability is achieved through the user profile that acts as a "meeting point" or a "point of interaction" for the public agencies to interact. A profile mechanism as such, can replace the government-to-government interaction with multiple government-to-citizen interactions. The platform should provide the necessary tools so that the applications can be integrated and consequently seamlessly present the information to the citizen. This can involve news feeds, notifications and alerts.

The platform provides two main interfaces, one for citizens and one for public agencies. PANP interacts with citizens using profiles, while public agencies interact with it using the *Public Agency Application Discovery and Integration (PAADI)* registry. Profiles are created based on the *Profile Management* mechanism. Profile management updates the citizens' profiles based on the public agency applications they have installed. In a similar fashion, PAADI is administered by the *PAADI Management* module, which is responsible for ensuring public agency applications authentication and availability. *Alerts and Feeds Mechanism* supply the profile with the public agencies' news feeds. Public agencies news feeds, also available through PAADI, can be considered as a personalized way of communicating with the citizens. They include information such as notifications about the tax filling or the payment of a public fee. Alerts are urgent notifications. The *Recommendation Mechanism* is a part of the personalization features provided by the platform. This module assists the citizen to arrange his/her profile, for example install the necessary applications to accomplish a life event. Upon removal of an application, this module will notify the citizen for the possible implications on the execution of the depended applications. The recommendation mechanism uses semantic tags to identify the related piece of information for a specific task and consequently proposes the applications to be added.

All the modules mentioned before are based on a platform-specific *API* and *PANP ML*. The proposed API should utilize web services of government agencies, corresponding to applications registered in PAADI. It should act as a gateway between custom agency web services and the platform. The main concern in API implementation focuses on confidentiality, data integrity, and availability of information. While confidentiality deals with the unintentional disclosure of information outside the authorized parameters, data integrity assures the trustworthiness of the information, and availability ensures that the information is made available to requesting authenticated clients. The mark-up language (PANP ML) should contain the required tags to implement citizen's profile. Thus, it should contain presentation and semantic tags facilitating citizen-related data presentation and exchange between public agency applications. The implementation of the PANP ML is still an open issue as many requirements should be fulfilled concerning the way the information is extracted and retrieved from the user's profile data and the way the processed data is represented to the user. It should also be extendable. The framework is supported by proper Authentication, Data Integrity,
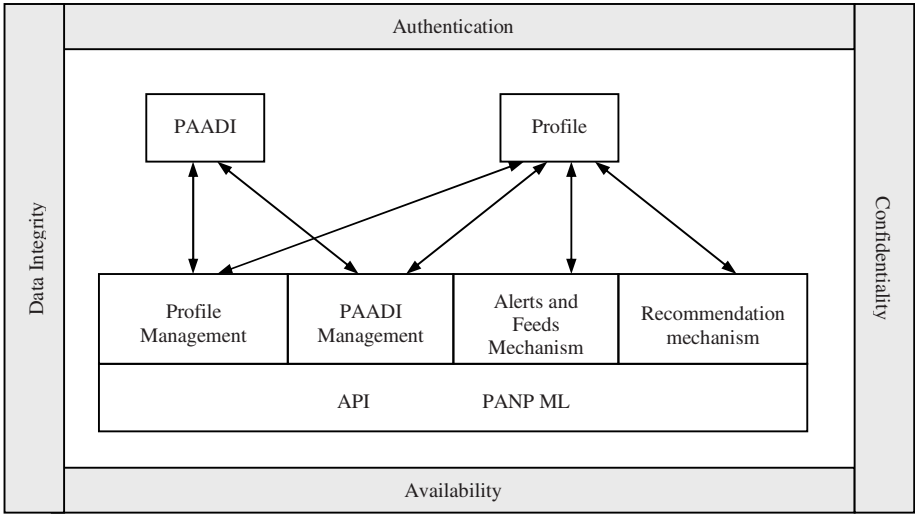
Fig. 1. Public Agency Networking Platform

Availability and Authentication mechanisms. An overall view of the proposed framework is presented in figure 1.

Communication between the citizen and the PANP may be done using HTTPs/SSL mechanisms. After registering for the first time, the citizen is asked to ensure the validity of some personal information that is preloaded by the corresponding agencies, for example social security number. He/she is also asked to change the initial password to a new sophisticated one. Then, the citizen may search for a public agency application in the PAADI. The applications have been implemented by the IT sector of the agencies using PANP ML and the platform API. Before the application is installed in the user profile, it requires the user consent to use the profile data. This is crucial to enforce citizen's data and privacy protection acts. Citizens may add as many applications as possible, thus initiating multiple connections with the public agencies. In order to accomplish a life event, the citizen orchestrates the relative applications already installed in his/her profile. We believe that this approach will simplify the complex process execution mechanisms proposed in the related projects and will enhance the citizens' trust to the platform.

The anticipated benefits will affect both citizens and public agencies. From the citizen point of view, the benefits, compared to other approaches such as active life event portals, come in the form of the explicit information management and user orchestration, as far as profile applications are involved. This assumption requires the user to obtain a clear view and knowledge of his/her profile applications involved every time a service is requested, i.e. a life event appears, and especially the data required and produced by them. The recommendation mechanism may assist the citizen to include in his/her profile all the public applications needed to service a specific life event. PANP approach may also contribute to overcome personalization obstacles, identified in [13], from the citizen's point of view as discussed in Table 1.

Table 1. User Obstacles to personalization [13] and PANP proposed solution

Obstacle	Solution
Control	The citizen has full control of both his/her data and public applications that will use them.
Privacy	Profiles are private by default. Additionally, every action made to the citizen profile requires explicit consent.
Trust	The citizen owns his/her data and is responsible for the use or the misuse. The only concern is addressed to the reliability of the public agency in charge to administer the platform.
Acceptance	We can not predict the acceptance of the platform. However, at first, some motives should be given to the initial users so as the network effects to take place.
Access	Single sign-on vision supports user accessibility. The platform could be easily deployed to mobile devices for further use.

From the public agencies point of view, along with the increased efficiency and quality of public service delivery, many legal and technical issues can be resolved as shown in Table 2.

Table 2. Organizational obstacles in the personalization [13] and PANP proposed solutions

Obstacle	Solution
Legal	The user owns his information and is responsible for the use or the misuse. Every action made to his profile (application installation and information access) requires his explicit consent.
Process based	The public agencies will maintain their infrastructures concerning the processes they accomodate. However interfaces will have to be implemented so as to offer their applications in the PANP Platform. It is assumed that this is less demanding than altering the internal infrastructures to offer cross-organizational services. We believe that this approach will require the minimum of public agencies' process re-engineering, as web service interfaces will interact with the platform through the API and the PANP mark-up language. No business process orchestration is needed as the platform is user orchestrated.
Financial	The implementation of the required interface can be regarded as an extra cost. However, overall the use of the platform will eliminate the need of having a personalized portal in every public agency, thus reducing cost.
Governance Based	The user himself is responsible to orchestrate the application workflow.
Technical	The user profile acts a common place for the public agencies to post the user information. The installed applications can access the user information. With this approach, no common databases are required to share the cross-organizational data .

5   A C2G Example

To illustrate the benefits of PANP approach, let us assume an example involving a new PANP user, named Helena Pap. Helena wants to accomplish a specific life-event, i.e. to fill an application for a job opening in the public sector. It is worth mentioning that employment and job seeking is considered as a common e-government service, implemented in most government portals. Helena has graduated from the Department of Informatics of the University of Athens and holds an M.Sc from the Harokopio University of Athens. She has been working as freelancer for three years, as certified by the Public Insurance agency. In the real world, Helena would collect the necessary transcripts from different public agencies and submit an application to personnel selection agency. The whole procedure should recur in case Helena wishes to apply for a new job opening. The conventional way to submit such an application is presented in figure 2, as UML activity diagram.
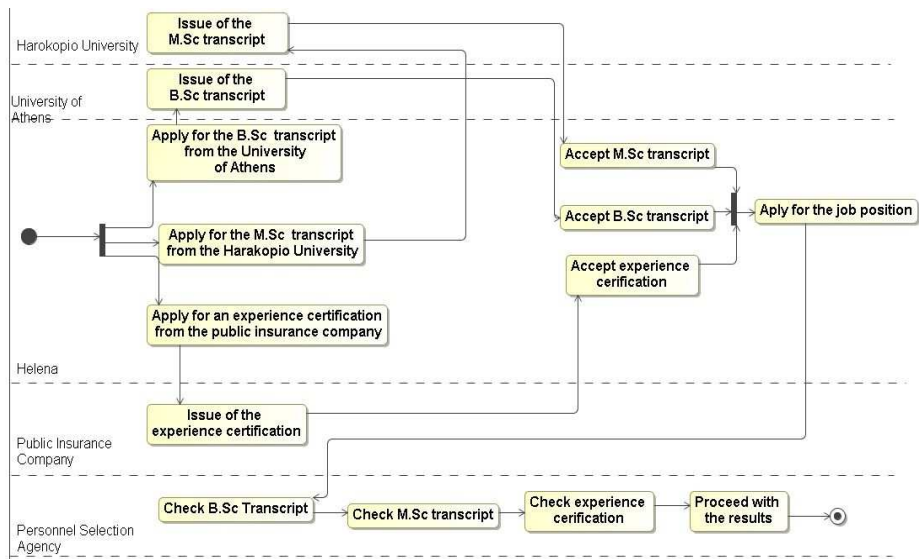
Fig. 2. Conventional procedure of applying for a job opening in the Personnel Selection Agency

In the electronic world the procedure is simplified. Upon log-in in PANP, Helena enters her profile. Some personal data (name, surname, ID number) have already been uploaded and Helena is asked to check their validity. Since Helena's task is to apply for a job opening, she searches the PAADI and adds in her profile the "Apply for job position" application, specifically implemented for the job opening in question by Personnel selection agency. Helena is informed by the Recommendation mechanism that her profile should contain some specific information concerning her B.Sc and M.Sc studies and her experience for the application to use. The information concerning the B.Sc can be obtained using "Issue pf a UoA BSc transcript" application that

initiates the interaction with the University of Athens. The application explicitly requires Helena's consent to use her personal data. Then, a corresponding web service initiated in the University of Athens site receives her name, surname and ID number and returns her degree title, grade and date of graduation, which are stored in her profile. Helena is able to decide whether the results will be permanently or temporary available within her profile or whether they should be periodically update or not. Consequently, she adds a similar application created and registered in PAADI by the Harokopio University of Athens that provides information about her M.Sc. Then, Helena installs "Issue an experience certificate" application initiating a channel with the public insurance agency that proves her experience. The agency returns and posts the information that Helena has been insured for 3 years in her profile. The "Apply for job position" application can now be performed using all her profile information mentioned above. Explicit user consent is required. The information is transferred to the Personnel selection agency for further processing and a receipt is returned and posted in her profile. When the period for submitting job applications expires, Helena will be notified with an alert from the Personnel selection agency concerning the outcome. Unfortunately, Helena is not qualified for this job opening, but a month later, the Personnel selection agency issues a new job opening. PANP recommendation mechanism can notify her for this. To do so, it uses her profile information after acquiring her consent, thus implementing personalisation services. The only thing Helena has to do is to add the application for the new job opening in her profile. The information about her bachelor and master degree remains the same, while the information about the insurance time is altered and a month is added to her overall insurance period. The example is demonstrated in figure3.
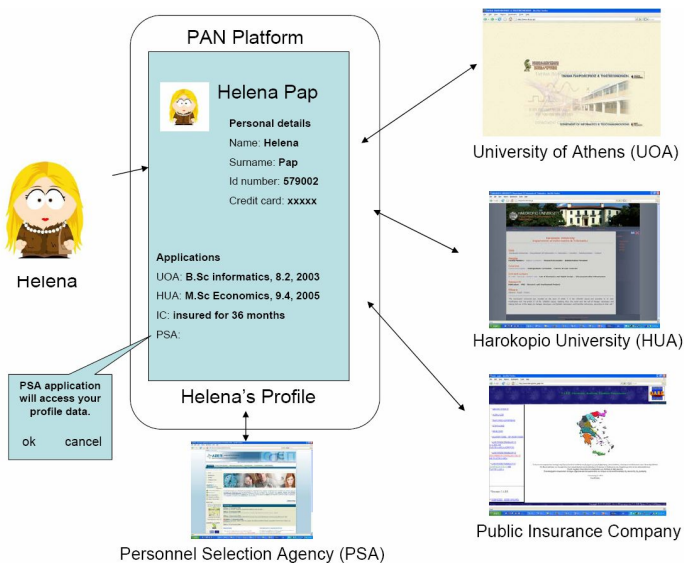

Fig. 3. The "Application for Job opening in the public sector" Example

In the above picture, a user orchestrated workflow is depicted to accomplish a job application in the public sector. Multiple applications are installed gathering the required user information from the public agencies. It should be mentioned that there is no interaction among them. Data exchange is implemented through the user profile.

6   Conclusion-Future Work

The current trend in the provision of the e-government services is described by the concept of the connected governance. Towards supporting this concept, we presented a Public Agency Networking Platform (PANP) facilitating personalized cross-organizational services. PANP a) assures the platform extensibility and modularity, b) eases the integration with existing e-government infrastructures as the platform relies on well defined existing mechanisms as web services and c) is compliant with the main law regulations and directives especially in the area of security and data protection as the user holds his/her own data in his profile and every action made in the platform requires his/her explicit consent. In contrast to other platforms and integration frameworks, PANP simplifies the process execution workflow as life events are accomplished through a user orchestrated process combining the functionality of discrete public agencies applications.

Our future work involves the implementation of a prototype. The platform API libraries should be implemented and the semantic and presentation tags of the PANP mark up language should be defined. It is our intention to provide a quite flexible and safe infrastructure for the public agencies IT departments to implement PANP applications. In addition, security issues will be thoroughly examined. Finally, we will further explore information extraction from the profiles, as it remains an open research issue.

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