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LNCS 8074

Electronic Government

12th IFIP WG 8.5 International Conference, EGOV 2013
Koblenz, Germany, September 2013
Proceedings

ifip

Lecture Notes in Computer Science 8074

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Maria A. Wimmer Marijn Janssen
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12th IFIP WG 8.5 International Conference, EGOV 2013
Koblenz, Germany, September 16-19, 2013
Proceedings

Springer

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ISSN 0302-9743 e-ISSN 1611-3349
ISBN 978-3-642-40357-6 e-ISBN 978-3-642-40358-3
DOI 10.1007/978-3-642-40358-3
Springer Heidelberg New York Dordrecht London

Library of Congress Control Number: 2013945407

CR Subject Classification (1998): K.4, K.5, J.1, H.3, H.4, K.6, H.5

LNCS Sublibrary: SL 3 – Information Systems and Application, incl. Internet/Web and HCI

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

The 12th annual international IFIP electronic government conference (EGOV 2013) was organized by the International Federation for Information Processing Working Group 8.5 (Information Systems in Public Administration), or IFIP WG 8.5 for short. IFIP EGOV is the European core conference in the domain of ICT research and practice developments in the public sector. Each year, scholars from all over the globe present the state of the art and most recent innovations and research in e-government, e-governance, and related fields of study. Since its commencement, the EGOV conference has provided important guidance for research and development in this fast-moving domain of study.

IFIP EGOV brings together leading researchers and professionals from across the globe and from a number of disciplines. Together with ePart, its sister conference on electronic participation, the conferences have attracted around 150 participants on average per year from all continents including developing countries. In 2013, scholars from four continents and from different disciplinary backgrounds met to share and discuss innovative as well as solidly developed theories, methods, concepts, and solutions for the domain of study.

As in previous years, IFIP EGOV 2013 was co-located with IFIP ePart, the IFIP conference on electronic participation, which aims at presenting advances in both social and technological scientific domains, seeking to demonstrate new concepts, methods, and styles of e-participation. Co-location of both conferences intentionally allows for exchange and cross-fertilization between the two domains of study. The Chairs of both conferences are committed to continuing the co-location. In 2013, IFIP EGOV was also co-located with Informatik 2013, which is the German Computer Society's major annual conference with around 1,000 participants each year. This way, German-speaking computer science and related information governance scholars were welcome to network with e-government and e-participation researchers and practitioners.

In 2013, e-government research again demonstrated its relevance to practice and, consequently, its influence on shaping government strategies and implementations. Conversely, e-government practice also inspired e-government research. The IFIP EGOV 2013 Call for Papers attracted a wide range of topics. In all, 27 papers were accepted for Springer's LNCS proceedings. These papers have been clustered under the following headings:

- Research Foundations
- Open Government Data and Transparency
- Service Design and Improvement
- Adoption and Service Evaluation
- Social Media and Social Network Analysis

Papers submitted to the ongoing research, poster abstracts, as well as workshop and panel abstracts were published in a complementary proceedings volume of

GI Lecture Notes in Informatics. The proceedings cover contributions from both conferences, IFIP EGOV and IFIP ePart. The volume contains approx. 30 paper contributions plus poster, workshop, and panel abstracts.

Per recommendation of the Paper Awards Committee, led by Committee Chair Prof. Olivier Glassey of IDHEAP, Lausanne/Switzerland, the IFIP EGOV 2013 Organizing Committee granted outstanding paper awards, as in previous years. The winners were awarded in the ceremony at the conference dinner, which has become a highlight of each IFIP EGOV conference. Their names can be found on the conference website: http://www.egov-conference.org/egov-2013/.

Many people make large events like this conference happen. We thank the 72 members of the IFIP EGOV 2013 Program Committee and the additional reviewers for their great efforts in reviewing the submitted papers. Andreas Jeworutzki of the University of Koblenz-Landau (Germany) supported us in the administrative management and in compiling the proceedings of IFIP EGOV 2013. Particular thanks go also to the conference organization of Informatik 2013 — colleagues and staff of the University of Koblenz-Landau, who organized the conference system, the room management, the catering, and the social events for the whole conference cluster.

The host of IFIP EGOV 2013 was the University of Koblenz, Landau in Koblenz, Germany. The Faculty of Computer Science has over 20 professors and consists of four institutes, each with four to six research groups. The faculty researches and teaches various strands of core and applied computer science, including e-government. In the winter semester of 2012–2013, the faculty introduced a new Master of Science program in e-government, a unique curriculum in Germany to be offered at a technical faculty. E-government is one of the four key research priorities of the faculty. Research and teaching cover investigations in strategic, analytical, managerial, conceptual, and technical aspects of introducing ICT in the public sector (administration and politics). Interdisciplinarity in design and analysis of study aspects is a central paradigm, particularly in the e-government research group, which is chaired by Maria A. Wimmer.

IFIP EGOV 2013 took place in the lovely city of Koblenz. Koblenz is situated in the northern end of the famous world cultural heritage area of the Upper Middle-Rhine Valley. The city has taken its name from the Roman word "confluentes," which stands for the intersection of the Rhine and Mosel rivers. Koblenz claims to have the only "real" German Corner — the Deutsches Eck. Since the German horticultural show in 2011, Koblenz has become a lovely city with an exciting lifestyle, culinary heritage, and culture. It is a formidable site for holding IFIP EGOV 2013. The city's long history with changing Roman and French occupation has created a rich cultural setting with numerous sites of interest in Koblenz and its surroundings. We are grateful to have had the great pleasure of holding IFIP EGOV 2013 at such a special place.

September 2013

Maria A. Wimmer
Marijn Janssen
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Electronic Government Research: Topical Directions and Preferences

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Abstract. We surveyed the worldwide e-Gov researcher community and collected data on disciplinary backgrounds, topical orientations, and publication preferences from over 200 scholars including more than 80 percent of the most prolific scholars in the domain. The results demonstrate the richness and diversity of electronic government research worldwide. Some topics are more prevalent in some regions than others. The paper presents the results and discusses, which directions the domain may take to further strengthen its growing reputation and recognition.

Keywords: Electronic Government Research, Topics, Academic Disciplines.

1 Introduction

Electronic Government Research (EGR) has evolved past its infancy [23]. It has been portrayed as a multi-disciplinary and in part interdisciplinary domain of study with a scholarly community of about 900 active individuals worldwide that have published their work in the English language [21, 22]. In terms of volume of EGR publications the core of this community numbers in the 200s. Among those are about 60 highly prolific individuals with double-digit numbers of EGR-related publications forming the innermost group or inner core of the scholarly EGR community [23].

In its early years the study domain had seen quite a few debates about the directions [1, 2, 6, 11, 14, 17, 28], the academic rigor [12, 13, 15, 16, 18, 19], and the acceptable standards of inquiry [7, 20, 29]. Depending on the rules in their respective home disciplines and sometimes contingent on academic geography, debaters proposed this or that standard as the solely acceptable benchmark for good quality EGR. And, of course, when looking through the lens of any particular discipline, EGR publications from other disciplines that adhered to different standards might not necessarily measure up well against the proposed yardstick. EGR, it became clear, comprised a variety of distinct disciplinary approaches, standards of inquiry, and measures of academic quality. It appears that these differences are now better understood and appreciated, and the plurality of contributions and cross-pollination through employing diverse perspectives are increasingly recognized as a plus rather than a liability of the study domain.

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 1–13, 2013.

The volume of EGR publications has dramatically increased from a couple of dozens in 2000 to almost 6,000 peer-reviewed academic contributions in the English language alone by mid 2013, and the annual going rate of peer-reviewed publications, that is, conference papers, journal papers, book chapters, and monographs has now reached almost 500 publications per year [23, 25]. Unlike other fields or study domains, in EGR the worldwide peer-reviewed English-language publications are collected, compiled, and updated semi-annually into a publicly accessible reference library, the Electronic Government Reference Library (EGRL), downloadable from https://catalyst.uw.edu/webq/survey/jscholl/22768. This resource allows for comprehensive bibliometric analyses of the study domain's accumulated body of knowledge at any given time including the major themes and directions in EGR. The EGRL along with the EGOV LIST mailing list along with other sources such as the Linkedin EGOV community with some 5,000 linked members allows for a profiling and assessment of publication productivity in the research community down to the individual scholar's level [22, 23]. When comparatively measuring the volume of papers for various themes and outlets, the EGRL provides a robust and verifiable basis of data for such undertakings.

However, we were also interested in the perceptions and recommendations as well as the personal disciplinary backgrounds and topical interests in the electronic government (EGOV) researcher community. Since the study domain had never been subject to forum or publication outlet rankings, we felt that the growing maturity of the domain warranted such an exercise and conducted a survey, whose results are published elsewhere [26]. Beyond the outlet preferences, we also captured participants' disciplinary backgrounds and major areas of research focus and interests, which we are presenting and discussing in this paper.

The remainder of the paper is organized as follows. We first review the extant, although parsimonious, literature on disciplinary backgrounds and research interests in EGR. We then introduce our methodology and the research question, which is followed by the presentation of the findings and the discussion of the results. We finally conclude and outline the limitations of this study along with future directions of this research avenue.

2 Short Literature Review

As indicated above the literature on disciplinary backgrounds and research interests in EGR is anything but exuberant. However, first attempts to identify the quality, characteristics, and directions of EGR were published between 2004 and 2006 and shortly after when the study domain was still in its infancy [1, 4, 7, 12-14, 18, 19]. By the end of 2003, the entire body of EGR knowledge represented about 12.6 percent of the accumulated volume of peer-reviewed EGR at the end of 2012 and amounted to some 700 publications in the English language, 60 percent of which were conference papers, while 35 percent were published in journals and the rest in monographs and edited books [23].

EGR reviews in those days tended to employ mono-disciplinary perspectives, for example, of MIS scholarship [12-14] or of Public Administration scholarship [18]; in these assessments, the accepted standards of the respective disciplines were taken for granted and stereotypically applied not only to studies from their originating fields, but also to those from different disciplinary backgrounds causing some irritation and controversy among EGR scholars. However, shortly after this discussion the multi-disciplinary nature of EGR was increasingly acknowledged and upheld [4, 7, 21, 23, 24, 26, 29, 30].

Around 2010, towards the end of the first decade of EGR, analyses for single journals (Electronic Government, International Journal of Electronic Government Research, and Transforming Government) appeared, which captured and presented journal-related geographic, institutional, and academic profiles of the EGR community [8-10]. Based on the EGRL at the same time, more comprehensive profiles, disciplinary backgrounds, and topical mainstays were presented and discussed which also calculated the size of the most prolific core of EGR scholarship (55 individuals) and the extended core (of less prolific) EGR scholars of 225 individuals [22, 23].

Management, organization, and transformation were found the most frequently and extensively studied topics in EGR in the first decade of its existence followed by topics such as digital democracy, electronic services, design studies and tools, policy, governance, and law, infrastructure, integration, and interoperability, information security, and EGR foundations and standard of inquiry [23]. A disciplinary breakdown of the core group of EGR scholars surfaced that Public Administration, Political Science, Management of Information Systems (MIS), Business Administration, Computer Science, and Information Science were the major primary disciplinary training backgrounds of the EGR core group [22].

In summary, EGR, a study domain beyond its infancy [23], has remarkably thrived since the appearance of its initial contributions by the end of the 20th century. The study domain has apparently embraced its multi-disciplinary composition. However, the multitude of evolving topical interests in EGR has not been documented against this backdrop. Neither have the disciplinary nor have geographical differences and preferences in EGR been studied and documented.

3 Research Questions and Methodology

3.1 Research Questions

The brief review of the literature illustrated a lack of knowledge and documentation regarding the particular research interests and directions in EGR, which scholars in the domain actively pursue or might want to pursue. Since these interests may vary relative to academic discipline, geographic region, or academic standing, the research questions are formulated as follows:

Research Question #1 (RQ #1): What are the specific research interests in EGR, and how prevalent are they in the view of EGR scholars?

Research Question #2 (RQ #2): Given the disciplinary backgrounds of EGR scholars, how do the specific research interests vary in EGR, and how prevalent are they with regard to respective disciplinary backgrounds?
Research Question #3 (RQ #3): Given the academic standing of EGR scholars, how do the specific research interests vary in EGR, and how prevalent are they with regard to the respective academic standing?
Research Question #4 (RQ #4): Given the geographic location of EGR scholars, how do the specific research interests vary in EGR, and how prevalent are they with regard to the respective geographic location?

As has been pointed out before, these research questions could be fully addressed by analyzing the data provided in the EGRL and augmenting these by data available from other public sources. The EGRL would allow for coding and categorizing the entries along the lines of authors' disciplinary backgrounds, academic standings, and geographic locations. Such analysis, reflective of the aforementioned categories, would give a comprehensive account of what actually was published before. However, when directly surveying EGR scholars one can expect to capture more recent or evolving interests in the domain. And, of course, the two approaches are not mutually exclusive. For this study the latter approach was chosen.

3.2 Sample, Instrument, and Data Collection

Sample. As mentioned above previous research had estimated the size of the core group of most active and prolific EGR scholars at 55 worldwide, whereas the inner EGR community was found to number in the mid 200's and the extended EGR community at around 700 individuals [22, 23]. The EGOV listserv (egov-list@uw.edu) membership roll as well as the Electronic Government Reference Library (EGRL, version 8.5, end of 2012) provided the main sources of information allowing for the verification of academic background and for survey-participant selection. When this study was conducted the EGOV listserv membership list contained 1,132 entries, 882 of which contained email addresses of persons with a verifiable academic background and an active involvement in EGR. In terms of size, this sample can be estimated as representing a very high percentage of the entire scholarly population in EGR [3].
Instrument. A structured Web-based questionnaire [5] was used containing a total of nine questions with required responses to the first eight questions. Question #9 provided a non-mandatory entry mechanism for specifying and rating outlets not listed as choices and for providing general feedback. Questions #1 to #5 inquired about the academic position, the greater geographical area, the primary and secondary academic disciplines, and the top-three sub-areas of EGR-related interest. For all questions, pre-configured responses could be selected including "other" for choices not listed. Question #6 to #8 interrogated about the perceived quality of pre-specified conferences, conference proceedings, and journals. As mentioned before the results of outlet preferences in the EGR community are published separately [26].
Data Collection. Between mid-November and early December of 2012 emails were sent worldwide to the 882 scholars identified as described above, explaining the purpose of the study and inviting recipients to take the survey providing prospective

participants with an individualized electronic link to the Web-based survey. A week apart, a total of three reminders were sent. The results were electronically recorded and automatically coded in a fashion for immediate use in SPSS. The survey response rate was 23.4 percent with 206 surveys fully completed and valid, which is relatively high and slightly higher than other studies using a similar technique and a three-wave solicitation procedure [27].

4 Findings

In the following sections the findings are presented one research question at a time. The overall results are presented first (RQ #1) followed by findings with regard to the disciplinary backgrounds (RQ #2), academic standings (RQ #3), and geographic location (RQ #4).

4.1 Overall Topical Orientations and Preferences (RQ #1)

As mentioned before, participants had been asked to rank their research interests into primary, secondary, and tertiary interests. For distinguishing the rankings, the primary choices were given a weight of 3, the secondary choices received a weight of 2, and the tertiary choices were counted with a factor of 1.

Table 1 shows the weighted "Topics of Interest" for all 206 participants. With 188 (or 15.21 %) the weighted score for *Open Government and Participation* was highest by some margin followed by *Transformational Government* (149/12.06 %), *Services and Information* (121/9.79 %), and *Social Media and Social Networking in the Public Sector* (112/9.06 %). The scores for this group of four topics, all with triple digits, amount to almost half the total score (46.12 %) indicating that at the time the survey was conducted these four topical areas were the most popular areas of interest among EGR scholars worldwide.

The second group of EGR areas of interest also comprises four topics with almost identical scores. With a weighted score of less than half the top score *Policy, Governance, Ethics, and Law* (90/7.28 %) ranks in fifth place closely followed by *Cloud Services, Enterprise Architecture, and Interoperability in the Public Sector* and *Open Data/Big Data* (89/7.20 % each). The relatively high rank of the latter two topics is not surprising given the rapidly growing proliferation of cloud computing etc. and open/big data in practice, whereas, in fact, the rank for the policy, governance, ethics, and law topics is at least remarkable. As a point of reference, the respective minitrack (a term for topic clusters) under the same title at the Hawaii International Conference on System Sciences (HICSS), despite being one of the oldest EGOV minitracks at that cluster conference, has never received a remarkably high number of submissions, although the quality of papers submitted to that particular minitrack has consistently been outstanding. In this "runner-up" group of topical interest another traditional topic is found, that is, *IT Service Management in the Public Sector* (87/7.04 %). The four topics have a combined group score of 355, which represents 28.7 % of the total score. So, the top-two topical areas account for almost exactly three fourths of EGR topics.

Table 1. Topical Areas of Interest in EGR

All Participants (Weighted Topics of Interest)	Weighted Score	Percent	Cumulative Percent
Open government and participation	188	15.21%	15.21%
Transformational government	149	12.06%	27.27%
Services and information	121	9.79%	37.06%
Social media and social networking in the public sector	112	9.06%	46.12%
Policy, governance, ethics, and law	90	7.28%	53.40%
Cloud services, enterprise architecture, and interoperability in the public sector	89	7.20%	60.60%
Open data / big data	89	7.20%	67.80%
IT Service Management in the public sector	87	7.04%	74.84%
Digital divide/s in the public sector	46	3.72%	78.56%
Smart cities, smart grids, and smart government	44	3.56%	82.12%
Electronic campaigning and elections	40	3.24%	85.36%
EGOV education, training, and professionalization	39	3.16%	88.51%
ICT-enabled crisis, disaster, and catastrophe management	31	2.51%	91.02%
Other	24	1.94%	92.96%
Infrastructure security	20	1.62%	94.58%
Electronic procurement and logistics	17	1.38%	95.95%
Cyber warfare	16	1.29%	97.25%
Geographical planning / geographical information system in the public sector	15	1.21%	98.46%
Electronic record management and archiving	13	1.05%	99.51%
Insider threats modeling, detection, and mitigation	6	0.49%	100.00%
Total Score	1236	100.00%	

The remaining two groups of topical interests combine both traditional specialty topics and novel topics, which might have the potential of commanding wider interest in the future. The third group of EGR areas of interest encompasses five topics: *Digital Divide/s in the Public Sector* (46/3.72 %), *Smart City/Smart Grids /Smart Government* (44/ 3.56 %), *Electronic Campaigning and Elections* (40/3.24 %), *EGOV Education, Training, and Professionalization* (39/3.16 %), and *ICT-enabled Crisis, Disaster, and Catastrophe Management* (31/ 2.51 %). While the digital divide/s topic has been studied for more than a decade, the other four topics are relatively novel. Their combined score equals 200 representing 16.2 % of the total score.

The last group of topical areas includes *Infrastructure Security* (20/1.62 %), *Electronic Procurement and Logistics* (17/1.38 %), *Cyber Warfare* (26/1.29 %), *GIS in the Public Sector* (15/1.21 %), *Electronic Record Management and Archiving* (13/1.05 %), and *Insider Threats Modeling, Detection, and Mitigation* (6/0.49 %) among other topics (24/1.94 %) altogether. This last group has a combined score of 111, or 8.9 % of

the total score. Interestingly, the two topics of infrastructure security and insider threat modeling/detection/and mitigation attract a relatively high number of submissions at HICSS indicating that these special areas have clustered around this venue.

When looking at the rankings of primary, secondary, and tertiary areas of interest, it is instructive to see that the topic of open government and participation tops both lists, primary and secondary topics of interest, and is second to transforming government on the list of tertiary interests. Also, the area of services and information is among the top four in all three lists. Interestingly, the areas of electronic record management and insider threat modeling, detection, and mitigation are either in the bottom four areas or not on the list at all. Further, GIS systems in the public sector is listed last, or last but one respectively, on the lists of primary and secondary interests. The low scores indicate that these topics are of special interest and only appeal to a small sub-group of the EGR community.

In summary, the lion share of topical interests in EGR is represented by eight topics with open government and participation attracting almost twice as much interest as the fourth (and last) topical group combined and almost as much as the third group altogether. Also in the top group of four topics were transformational government, services and information, and social media and social networking in the public sector.

4.2 Topical Orientations Relative to Disciplinary Backgrounds (RQ #2)

In this part of the analysis, we are distinguishing four major groups of disciplinary backgrounds, that is, Public Administration and Political Science (n_p=48), Management of Information Systems and Computer Science (n_{mc}=106), Information Science (n_i=15), and other disciplinary backgrounds (n_{od}=37). While so doing, it is acknowledged that Public Administration research and Political Science are distinct disciplines as are MIS and computer science. These four distinct disciplines were only clustered with regard to their technology affinity, or non-affinity, respectively. Public Administration and Political Science it was assumed were less technology-affine than MIS and Computer Science. It is explicitly not suggested that differences between these traditional disciplines are minor or negligible. Only with regard to their relative distance when studying technology-related phenomena they appeared to be clusterable.

Unsurprisingly, scholars in the cluster of *Public Administration* and *Political Science* ranked the four areas of (a) open government and participation, (b) transformational government, (c) policy, governance, ethics, and law as well as (d) social media and social networking in the public sector highest accounting for almost 55 percent of the weighted score total. In the second group of topical preferences (d) IT service management in the public sector, (e) services and information, and (f) electronic campaigning and elections were most favored representing another 23.7 percent of the total weighted score total. So, the top seven areas of interests accounted for 78.67 percent of topical interests in EGR from a public administration or political

science scholar's perspective. However, maybe even more interesting was to find that some topical areas were absent from the lists of interest of public administration and political science scholars: (1) infrastructure security, (2) electronic procurement, (3) cyber warfare, (4) electronic record management, and (5) insider threat detection, modeling, and mitigation.

With 51.5 percent of survey respondents *MIS* and *Computer Science* represented the largest cluster (n_{mc}=106) in the sample. Scholars in this cluster had the widest range of topical interests (20+); however, despite the large number of topical interests in this part of the scholarly EGR community, seven topics covered the vast majority of interests. The top two areas were (a) open government and participation and (b) transformational government. These were followed by (c) cloud services, enterprise architecture, and interoperability in the public sector as well as (d) services and information, (e) social media and networking, (f) open data/big data, and (g) IT service management in the public sector, which altogether accounted for 69.5 percent of the weighted score total in that cluster.

Although a relatively small group (7.3 %, or n_i=15), *Information Science* represented a distinct scholarship among survey respondents. Clustering information science with one of the former two groups was seen as inadequate since the field maintains a middle ground in terms of technology affinity; it is neither highly technology-affine, nor the opposite. And, in fact, some remarkable differences surfaced in the preferences of this field's respondents. They ranked highest (a) services and information highest, followed by (b) policy, governance, ethics, and law, and (c) cloud services, enterprise architecture, and interoperability in the public sector. Also, the topics of (d) open government and participation, and (e) ICT-enabled crisis, disaster, and catastrophe management, all of which combined to over half of the weighted total score of topical interests of information science scholars in EGR. Remarkably, the information scientists had little interest in open data/big data, transformational government, and social media and social networking in the public sector.

EGR scholars from all other disciplines (n_{od}=37), representing 17.98 percent of all respondents, had the following top-five areas of interests: (a) open government and participation, (2) transformational government, (3) open data / big data, (4) social media and social networking in the public sector, and (5) services and information, which amounted to almost 56 percent of the weighted total score of interests. Interestingly, EGR scholars from other disciplines than the aforementioned had no interest in insider threat modeling, detection, and mitigation, infrastructure security, ICT-enabled crisis, disaster, and catastrophe management, and digital divide/s.

In summary, unsurprisingly depending on disciplinary backgrounds the topics of interest vary, and so do their rankings. However, the topic of open government and participation appears in the top five interests of all disciplinary backgrounds, and transformational government along with services and information make the top five in three of four disciplinary clusters or fields.

4.3 Topical Orientations Relative to Academic Standings (RQ #3)

It was assumed that the topical interests of EGR scholars might also vary with their academic standing. By and large, academic standing can be distinguished along the lines of tenure track and non-tenure track. Scholars on tenure track can either be senior, that is, tenured in the ranks of associate or full professor, or junior, that is, untenured at the ranks of assistant professor. Non-tenure track scholars encompass research professorships, and post-doc positions among other including non-tenured teaching positions. Three clusters of respondents were formed accordingly with tenured faculty (n_{ten}=89), untenured (tenure-track) faculty (n_{unt}=28), and other EGR scholars (n_{os}=89). Coincidently, the two respondent groups of senior faculty and other scholars were equal in size.

Senior faculty were mostly interested in (a) open government and participation, (b) transformational government, (c) social media and social networking in the public sector, (d) services and information, and (e) IT service management in the public sector (combining to 54.12 percent of the weighted score total). Of least interest to this group were cyber warfare, electronic procurement and logistics, infrastructure security, and insider threat modeling, detection, and mitigation.

Junior faculty shared the top four topics with senior faculty, (a) open government and participation and (b) social media and social networking in the public sector, (c) transformational government, and (d) services and information, although in slightly different order. As fifth-ranked topic junior faculty was interested in (e) electronic campaigning and elections. The top five topics accounted for 55.36 percent of the weighted score total. This group was least interested in cyber warfare, insider threat-related topics, and GIS.

Non-tenure track EGR scholars also ranked (a) open government and participation and (b) transformational government on top, followed by (c) services and information, (d) cloud services, enterprise architecture, an interoperability, and (e) open data/big data comprising 55.81 percent of the weighted score total. The bottom ranks of interest encompassed cyber warfare, electronic procurement and logistics, GIS, and insider threats-related topics.

In summary, tenure-track faculty shared the top four topics, and three topics, ranked among the top five topics, were found across all academic standings. Insider-threat-related topics were found special-interest topics along with GIS-related topics.

4.4 Topical Orientations Relative to Geographic Location (RQ #4)

Geographic locations of EGR scholars had been covered marginally in previous investigations, when topical orientations were considered. In this study, the largest group of respondents came from Europe and the UK (n_{eu}=113, or 54.9 %) followed by respondents from North America (n_{na}=51, or 24.8 %) and from other world regions (n_{or}=42, or 20.3 %).

European and UK EGR scholars had a strong preference for (a) open government and participation, (b) transformational government (c) services and information, (d) cloud services etc., and (e) IT service management together accounting for 59 percent

of the weighted score total, whereas GIS-related topics, crisis-related topics, and insider threat-related topics were at the bottom of the ranking.

North American scholars in contrast, while likewise being interested in (a) open government and participation, ranked (b) social media and social networking in the public sector, (c) open data/big data, (d) policy, governance, ethics, and law, (e1) services and information and (e2) transformational government as their highest-scoring topics of interest. These six topics accounted for 58.6 percent of the weighted score total. It is noteworthy that this group was least interested in the topics of EGOV education, electronic record management and archiving, and insider threats-related topics.

The other geographic areas ranked fewer topics of interest than the other two: the top-five topics were (a) transformational government, (b) open government and participation, (c) social media etc., (d) IT service management, and (e) electronic campaigning and elections representing 52.8 percent of the weighted score total. At the bottom of the list of topics of interests (with no mention) were cyber warfare, electronic record management, and insider threats-related topics.

In summary, while open government and participation along with transformational government were among the top topics of interest also in the geographical breakdown, greater topical variety emerged in the top five topics of interests depending on geographical location.

5 Discussion, Future Research, and Concluding Remarks

The study's object has been to uncover the breakdown of topical interests in EGR. Once a better understanding of the breakdown of topical emphases and of the variety of EGR is established in detail, an assessment of the direction of the EGR study domain can be undertaken. The findings here are based on a survey of the worldwide EGR scholar population. The response rate was relatively high (23.4 %) overall and exceptionally high among the most prolific EGR scholars (81 %). So, some confidence in the robustness of the results appears warranted. However, with 54.9 percent responses from Europe and the UK, the overall results presented here might possibly be skewed towards European/UK preferences. In the geographical analysis (RQ #4) evidence was given that the European/UK topical preferences were different in part when compared with those from other parts of the world.

That notwithstanding and regardless of disciplines, academic standings, and geographic provenance of EGR scholars, the topics of open government and participation and transformational government were the most frequently mentioned topics of interest in EGR. The former topic emerged under this label only a few years ago and since has rapidly moved to the top of the list, so some caution with regard to its long-term popularity might be in order. Future studies will find out how sustainable the topic has proven to be. When compared to earlier studies that listed the topics of (a) management organization, and transformation, (b) digital democracy, (c) electronic services, (d) and policy-related topics as prevalent [23], it appears that these topics have been continued under slightly different denominations and

combinations. In other words, these topics have maintained a high amount of scholarly interest over the years. Other topics such as (e) design studies and tools [23] might have been absorbed at least in part into what is now labeled IT service management. Compared with the previous study, the broadly attractive novel topics of interest in the top two groups are open government and transparency, social media-related topics, cloud services-related topics, and open data/big data. Of more special interest were novel topics such as ICT-enabled disaster management, cyber warfare, and insider threats-related topics, which had never been mentioned before. At the same time traditional special interest topics such as GIS-related topics and electronic record management have not gained stronger traction. However, the fact that a topic is not ranked high in the table does not mean that it is uninteresting or fading, but rather that only fewer EGR scholars are inclined to engage in it.

In the absence of a comprehensive bibliometric analysis of the EGRL no more detailed trends on topical preferences of EGR scholars from the past to the present can be given at this point. Still, while bibliometric analyses of already published work present objective data on topical preferences and interests in the past as can be found in the EGRL, a survey provides a snapshot of most recent interests including EGR scholars' intention to engage in future studies in a specific area. In other words, this study might also help identify emerging topics, which attracted higher attention and heightened interest at the time of taking the survey. A repeat of this study will be able to show how topical interests have changed over the years also from scholars' perspective. In future research, it is planned to analyze and systematically compare survey-generated data with bibliometric data in more detail. For conducting such research the EGRL will serve as a comprehensive resource.

In summary, as a multi-disciplinary domain of study, EGR has always covered a wide variety of areas of study, many of which are of great interest across disciplines, academic standings, and geographical areas. This is even more profoundly shown through this study. EGR appears to have emerged as an academically pluralist and global undertaking, which continuously generates a rich and diverse research agenda fueled by contributions from quite a number of fields, and the scholarly community is seemingly both willing and capable of embracing rather quickly novel phenomena from various angles of view.

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Territorial Governance, E-Government and Sustainable Development Policy: A System Dynamics Approach

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Abstract. The goal of this paper is to demonstrate how system dynamics modelling can be used in e-government policy and systems as an aid to spport territorial ananlysis, planning and governance, sustainable performance in urban areas and the assessment of policy outcomes. Topics such as renewable energy, efficiency, the design and exploitation of urban energy, water and waste management infrastructure and the alignment of different stakeholders provide relevant fields of study for the analysis of this paper. Specifically, we reflect upon the way in which a preliminary dynamic performance management model of an exemplary case study can be used to foster a common shared view among different policy makers as a way to highlight new ways to enable sustainable development in urban areas.

Keywords: territorial governance, egovernment, sustainable development policy.

1 Introduction

Territorial governance is an important element of the many complex challenges the world faces today. These include: sustainable development, adaptation and mitigation to climate change, rapid urbanization, growing food and energy insecurity, increased natural disasters, etc. [1]. Good territorial governance is typically seen to be supported by the development of e-government policies and systems at the state, regional and urban levels [2, 3].

Sustainable development in metropolitan regions in Europe and around the world is generally measured in terms of both being part of a global economic network (i.e., for instance, in relation to the proliferation, spread and emergence of transnational corporations) and generating a strong public service making the urban territory more attractive to international knowledge, technology and innovation [4, 5]. The former are considered building blocks of a sustainable innovative economy, a strategic resource in the urban territory, which is tightly related to public sector reforms. Such features are critical factors since the design and development of present and future e-government policies and systems is seen as the key locus of innovation in the public sector [6], in order to enable the enhancement of performance management in government organizations, and specifically in urban governance and sustainability [3, 7, 8].

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 14–25, 2013.

Implicit in this world-wide programme of e-government, found in countries of all levels of development, is a strong sense of managerialism, with e-government often seen as an essential part of a necessary process of reforming and reshaping management practices in the public sector, especially in projects and reforms which will establish accountability systems, increase transparency and reduce corruption [2, 18-20]. Earlier studies of system dynamics (SD) have been developed to map the dynamic complexity related to e-government policies [9-11]. SD has also been used to explore the core capabilities of local governments as key-factors to exploit the benefits of digital government [12]. It has also been applied to model stakeholders behaviour, learning, knowledge management, inter-institutional dynamics and citizens trust in e-government policy initiatives [13-17]. Yet the evaluation of territorial governance policy on the performance of urban areas requires a more nuanced methodological approach. One where the contextualisation of the systemic geography of a city and its critical institutions [2, 21] are considered in order to understand the nature of innovation dynamics in urban regions, in terms of sustainable development. Though urban studies are a tradition in SD literature [22], to our knowledge, this is the first paper to propose a dynamic performance management system applied to territorial governance, e-government and sustainable development.

E-government policies and systems within the scope of this paper address sustainable development, innovation and economic growth in urban areas and the state's spatial development plans (including state infrastructure for water, energy and waste management), metropolitan and regional policies and other governmental interventions and activities such as in the environment, housing and energy efficiency. However, it can equally be of relevance for tourism, health care, education, crisis management, disaster management as well as for the participation and interaction with the citizens in the creation and re-creation of the city's landscape (also in the politics of urban planning).

The exemplary case study of Hammarby in Sweden was chosen because of its advanced programmes and achievements in the key areas of study of this paper, namely territorial governance, e-government, sustainable development and urban environmental performance. Hence, how can e-government support territorial governance and the coordination of sustainable development policies across different urban organisations and stakeholders? How can we use SD to design a dynamic performance management system, which can: a) outline key performance drivers of sustainable development, and b) enhance a common shared view among policy makers about sustainable territorial performance (i.e. sustainable development and good urban governance)? The following section reviews the literature on territorial governance, e-government and sustainable development. Next we address the use of SD in the assessment of urban performance for sustainable development. Then we present the exemplary case-study of sustainable development, e-government and eco-cycle modelling in Sweden. Conclusions follow a discussion of the agenda for policy performance management in sustainable urban development.

2 Territorial Governance, E-Government and Sustainable Development

Addressing and being prepared for climate change is a key policy priority in Europe. Both the Lisbon Agenda and the EU Strategy 2020 are calling for measured and targeted improvements in urban environmental sustainability, emphasising specific methods and clear performance objectives. These include the rapid ratification of the Kyoto Protocol and the introduction of the Energy Performance Building Directory in the European region, an energy taxation directive adopting environmental liabilities for building owners, stressing the sustainable use of energy within a new regulatory framework. Therefore, one of the most important challenges faced by metropolitan regions and municipal governments globally is to identify and support policies, systems and dynamics leading to good territorial governance and sustainable development in view of climate change.

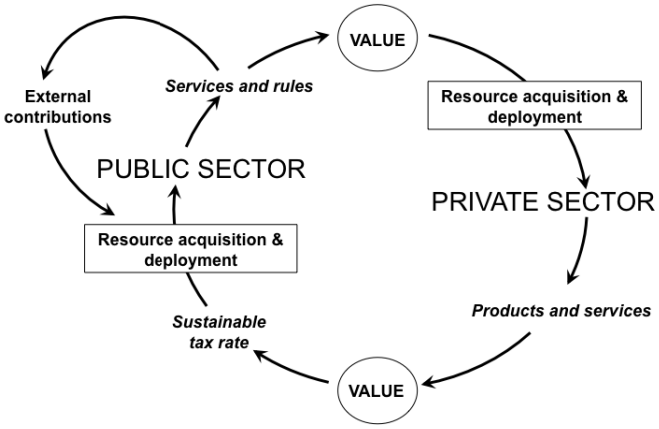

Fig. 1. A systematic framework embodying both the public and private sector: value generation as a focus for assessing performance and a prerequisite for information flows in sustainable development policy.

van der Molen and Wubbe [23] highlight the importance of urban e-government policies and systems when the public administration, private sector and citizens decide on issues where the spatial component is one of the determinants of decisions, such as when there is a need to access relevant spatial information, and could contribute in a meaningful way to the process of spatial decision making. Without these digital facilities, modern governments cannot understand the built environment of cities, manage land efficiently, utilize computer capacity to assist policy making, or retrieve significant value out of land. In the latter circumstances the value that can be considered important for good territorial governance would be safeguarding the reliability, availability, access and use of spatial information, which can be used in e-governemnt for the fulfilment of societal objectives, sustainable development and climate policies [24]. Gathering and compiling such information, beyond the public sector policymaking and decision making processes, would encompass industrial activities, small and

medium sized enterprises and many complex relationships between the political and the organisational systems in the public and private sectors [25].

Figure 1 shows public and private sectors dynamics, and how the rules underlying the survival and development of both sectors lie behind their own capability to generate value, to promote sustainable development. Figure 1 also shows how public sector performance does not only provide feedback under the form of taxes and financial contributions from the community receiving a given set of services, but also in terms of external contributions and, we would add, the same applies to information flows in sustainable development policies. So, the private sector feeds back to the public sector: public opinion is primarily affecting the political level, and income primarily affects the funds that the public administration will be able to raise through taxes and other sources to provide the administration level with resources to afford public expenditures. This, we would add, happens increasingly via specific programmes of modernisation and informatisation of the public sector (commonly referred to as new public management [19, 26] and often noted in e-government initiatives [19-23].

However, recently the same argument has extended also to the possibility to foster sustainable economic development and the aversion of climate change through policy making and regulation, the promotion of investments, purchases and employment, and by implementing ambitious modernization programmes for the delivery of public services (i.e facilitating creative interaction between universities, scientists and researchers on the one hand and industry and commerce on the other driving technology transfer and innovation) [3]. Yet there is no clear comprehensive or holistic methodology in place about how to enhance performance management, monitor and assess progress towards sustainable territorial performance in urban areas via the parallel improvements in public sector innovation and in the implementation of EU policies and guidelines [1].

3 A Dyamic Performance Management Approach to Enhance Sustainable Development in Urban Areas

According to Bianchi & Riverbank [33] one possible avenue to enhance performance management in the public sector is the application of system dynamics, where modelling organizational systems and simulation techniques are used for understanding the behaviour of complex systems. The advantage of using this approach is placing performance measures into the broader context of the system, responding to the reality that even simple policy and process changes to impact specific outputs and outcomes are not likely to be that “simple” in organizations [35]. The main focus is on the wider system, and policy implications for each player can be taken by the light of the responses that the observed system’s behaviour is likely to give, as a consequence of changes in its structure.

If one takes the point of view of each decision maker on behalf of whom a SD model is developed, such a perspective could be defined as ‘external’, since it does not primarily reflect the observation point of a specific decision maker [16]. A critical tipping point in managing organizational and territorial (inter-institutional) performance

is associated to the capability of policy makers to: a) identify those strategic resources which most determine the success in the environment (i.e. competitive and social systems) where an organization or different organizations operate; b) insure that the endowment of such resources is satisfactory over time; c) keep a proper balance between the different relevant strategic resources. SD can then be used to enrich performance management in local government, focusing specifically on how the development of conceptual and simulation models can foster a common shared view of the relevant system among stakeholders. This implies that the number and range of stakeholders involved in making decisions influencing strategic resource dynamics — and, therefore, the relevant system's performance and feedback loops — are often located in several organizational units and institutions in a given territorial area.

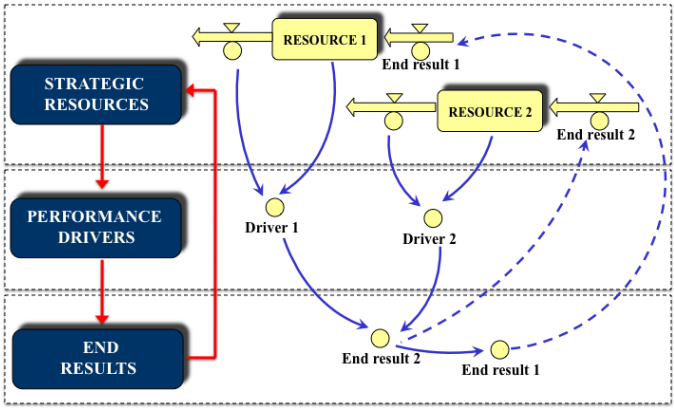

Fig. 2. A dynamic performance management view

Figure 2 illustrates how the end-results provide an endogenous source in an organization to the accumulation and depletion processes affecting strategic resources. End-results that most synthetically measure the overall organizational performance are flows affecting the accumulation of corresponding strategic resources that cannot be purchased. These are: 1) resources generated by management routines, and 2) financial resources [33]. Figure 2 also highlights that performance drivers are a measure of factors on which to act in order to affect the final performance. For instance, if related to an end-result such as the number of new business initiatives undertaken in a urban area in a given time span, corresponding performance drivers could be associated to the (financial and socio-political) perceived stability of a region, and to the perceived transparency and promptness of the public sector (e.g., in terms of authorization protocols or supply of various services, such as those related to security, transportation, social assistance, housing).

In order to affect such drivers in the desired direction, each decision maker must build up, preserve and deploy a proper endowment of tangible and intangible strategic resources systemically linked each other. The growth of a single organization and of a territorial community (like a urban area) embracing different institutions can be sustainable if the rate at which end-results change the endowment of corresponding

strategic resources is balanced. This implies that each institutional decision maker is able to increase the mix of strategic resources and that this increase is not obtained by reducing the endowment of the wider strategic resources in the territory [33].

4 The Case Study: Sustainable Development, E-Government and Eco-CycleModelling in Sweden

We now describe the case study of Hammarby [36], a district of Stockholm in Sweden, including how specific territorial governance policies, e-government systems and dynamic performance measures were used to promote urban development and environmental sustainability. Our goal is to show how a systems approach can help public officials move to good territorial governance and performance and identify several possibilities of how SD can be used to improve territorial performance in terms of sustainable development.

Hammarby is an admirable example of urban transformation, demonstrating the potential of sustainable development policy and eco-cycle modelling in the dynamic performance assessment of the interaction between different urban processing systems. Formerly a run-down part of town in Stockholm's industrial area affected by heavy pollution problems, it become an environmental role model in less than a decade. The city council developed the eco-cycle model to integrate environmental results with strategic planning. An ambitious programme to recycle all waste or waste water to turn into renewable energy was introduced to efficiently use the resources required by households (fig. 4).

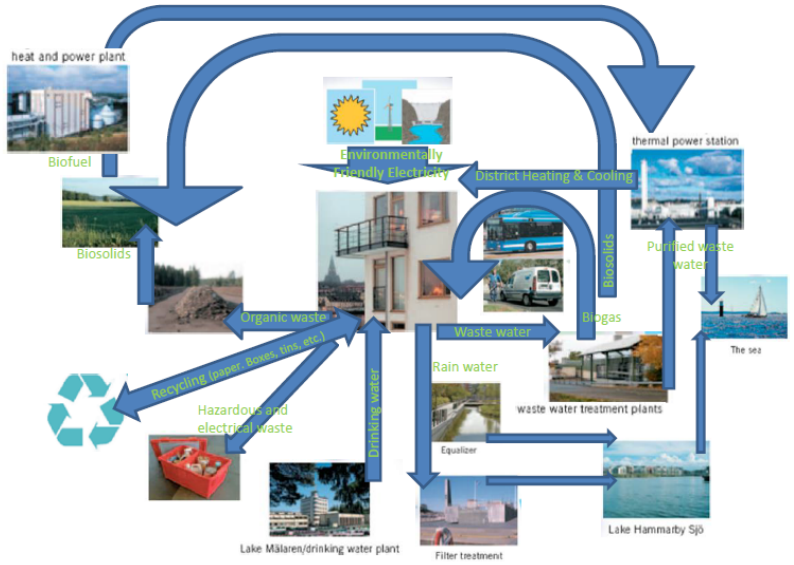

Fig. 3. Hammarby's territorial management model

The initial success of the Hammarby model to bring forward the priorities of integration of urban sustainability, information and communication technology and energy efficiency led to the recent establishment in 2011 of a Minister for Information Technology and Energy within the Ministry of Enterprise, Energy and Communication. Coordinating various former individual policy makers and institutions, the ministry is a notable example of how territorial governance and e-government can support the coordination of sustainable development policies across different urban organisations and stakeholders.

A preliminary territorial dynamic performance management model is presented in figure 5.

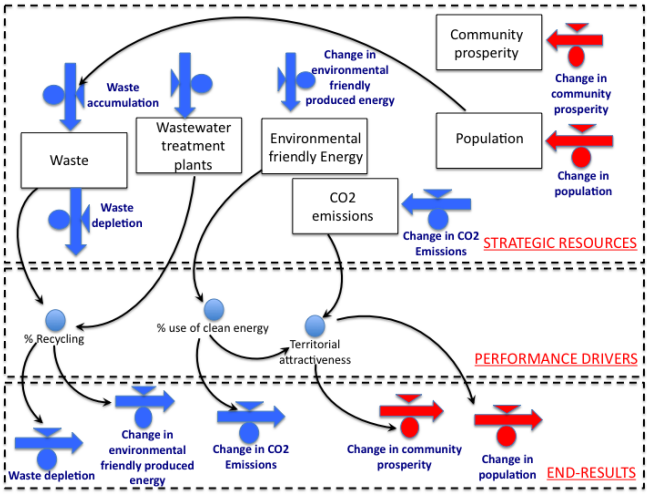

Fig. 4. A SD insight model portraying Hammarby's territorial performance

The figure shows how the outcome indicators to take into account in order to monitor the effectiveness of adopted territorial policies in the investigated case-study, can be referred to two different sequential levels. On the one side, waste depletion and the change in environmental friendly produced energy are specific end-results for the project. They allow decision makers to affect waste accumulation and the stock of environmental friendly produced energy. Such end-results are affected by the recycling % (i.e. the ratio between recycled and total waste). Such driver is, in turn, affected by the investments in wastewater treatment plants (strategic resource) and by the stock of waste.

Figure 5 also shows how the stock of environmental friendly produced energy affects a second critical driver, i.e., the % use of clean energy. This driver, on the one side affects the change in CO2 emissions in the territory (i.e. a third end-result); on the other side, it directly affects the territory attractiveness (i.e. a third performance driver). In fact, a higher % of clean energy produced in the territory will not only affect the environmental pollution levels, but also will directly generate less expensive available electric power available for the different players in the territory.

The ultimate effect (i.e. the outcome) of the described policies can be related to the effect of territory attractiveness – other things being equal – on community satisfaction (prosperity and wealth) and on the stock of population. This set of outcome measure is likely to play a quite counter-intuitive behaviour in the urban area. In fact, on the one side a higher achieved community prosperity will sustain more investments to foster the described policy. This might also imply a stronger and wider level of participation by several decision makers from different public/private sector institutions. This would indicate a higher level of trust and cohesion in the territory. Therefore, such first effect of the policy would underlie a growth-oriented reinforcing loop.

The role of e-government policies and systems in the production of the results described above is not the least important. As early as 2001, the Swedish government appointed a forum for ICT and the environment, under the then Minister for the Environment. Work was implemented in a working group consisting of representatives from industry, research, the Swedish Environmental Protection Agency (Swedish EPA), ministries and environmental organisations. Members of the group and its secretariat staff were recruited from both the private and the public sector [38, 39].

According to a 2007 Swedish Country Report to the International Council for Information Technology in Government Administration [37], the following three emerging e-government trends were reported from within Sweden: a) the traditional reliance on independent individual agencies is complemented with a reliance on functional 'agency federations'; b) The Swedish national agenda becomes more and more intertwined with the agenda as an EU Member State; c) The new (Autumn 2006) Government is signaling more emphasis on joined-up issues and an extended eGov portfolio for Verva, an Administration Development Expert Agency.

Hence, while Hammarby's vision was being implemented by the municipal government of Stockholm all Swedish government agencies were preparing to move from an agency centric mode of information production and management to a service oriented architecture to offer their information vault capabilities 'as a service' [40] increasing private sector initiative intensiveness and projects fostering information transparency and capillarity. Various cooperation projects were implemented between the government, public authorities and the construction industry [39]. And finally a number of successful best practices have emerged from the private sector (especially in knowledge based industries), substantially increasing projects and initiatives also in traditional sectors like buildings, transport and logistics – overall increasing the attractiveness of the territory and creating new professional profiles, job opportunities and employment.

5 Towards an Agenda for the Evaluation of Urban Performance and Sustainable Development

Figure 6 illustrates the building blocks of territorial performance, sustainable urban development and the role of e-government policies and systems. The end-results of the exemplary case study presented in this paper can provide an endogenous source in

the urban territory to the accumulation and depletion processes affecting strategic resources for sustainable development. These can be outlined in terms of climate change preparedness, liveability and citizens' satisfaction. In fact, they can be modelled as in or out-flows, which change over a given time span the corresponding stocks of strategic resources and as a result of actions implemented by public decision makers, possibly with the active participation of private sector institutions.

For instance, municipal projects for sustainable urban development may change private sector participation in such projects (strategic resources) as well as the overall employment rate (end result). A responsible behaviour in energy use (an end-result) and the use of available and emerging technologies in the public sector and surrounding region (a strategic resource) may lead to the reduction of CO2 emissions (end-result) and can in turn influence performance drivers such as energy use. There are also interdependencies between different strategic resources, urban infrastructure and the resulting spatial planning and environmental quality of an urban area: energy produced, water used and waste produced and recycled may affect not only the reduction in waste and water pollution, but also air quality. Furthermore, both presence and functioning of e-government policies and systems can in turn affect changes in energy use and production and support overall progress towards sustainable development both in terms of processes as well as outcomes.

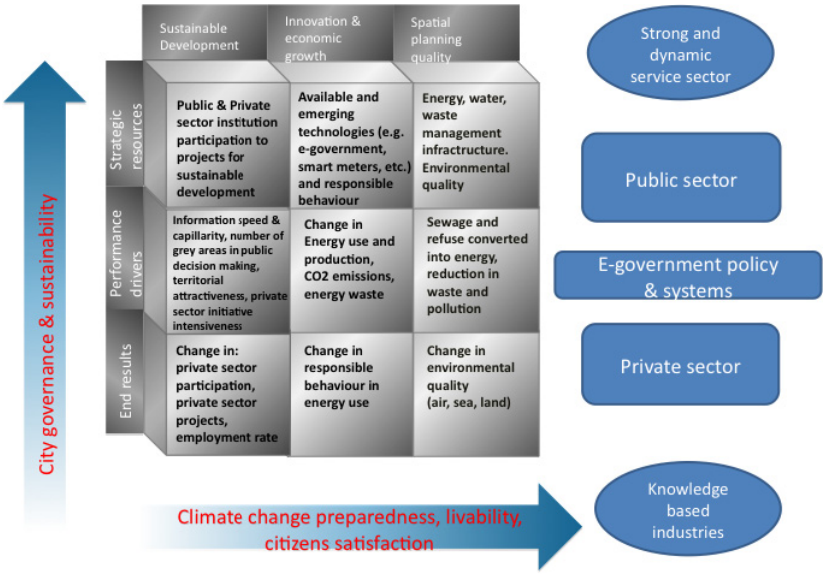

Fig. 5. Building blocks of territorial performance, sustainable urban development and the role of e-government policies and systems

A dynamic performance management perspective would stress that city governance and sustainability can improve if the rate at which end-results change the endowment of corresponding strategic resources is balanced. This implies that metropolitan management could be able to increase the mix of strategic resources and

this increase is not obtained by reducing the endowment of the wider strategic resources in the territory including climate change preparedness, urban liability and citizens' satisfaction.

As shown in the case study, the combination of monitoring data with other urban data sets provided the base for the design of a dynamic performance management system on the theme of climate change and sustainable development supported by e-government policies and systems. If analyzed and designed from the perspective and demands of policy makers and with the adoption of a SD approach, e-government policies and systems can provide tailor-made information and maps which can directly be used in support of an integrated climate change policy, city governance and sustainable territorial development.

6 Conlcusion

The case study of Hammarby provides evidence of the building blocks of territorial performance, sustainable urban development and the capacity of an integrated e-government policy and for the simultaneous consideration of the environment in budgets, excellent spatial planning, reporting and SD based territorial policy development and monitoring. Most interestingly, a scenario analysis using a preliminary dynamic performance management system highlights a number of counter-intuitive elements in the capacity to transform waste into environmentally sustainable electricity, the increase in job opportunities and of the employment rate and the conversion of a former city brownfield in Stockholm into one of the world's most successful eco-villages.

In conclusion, preliminary SD models can be used to highlight new ways enabling sustainable development in urban areas. The case study also suggests that SD can provide policy makers with an overview of the strategic resources, performance drivers and end results needed to support improvements in the environmental quality of urban areas and for future investigations on the roles of public and private institutions in the development and implementation of climate change policies. We also find that a SD modelling in an inter-institutional context for the integration of sustainability issues in performance management and for the evaluation of sustainable development in urban areas may provide policy makers with new ideas to enable sustainable urban development and foster a common shared view among policy and decision makers allowing the networking of stakeholders at different levels (i.e. city, region and national) for the promotion of welfare and development and the extendibility of these networks to interact in collaborations on a global scale.

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Political Will and Strategic Use of YouTube to Advancing Government Transparency: An Analysis of Jakarta Government-Generated YouTube Videos

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Abstract. Government transparency is critical to cut government bureaucracy and corruption, which diminish political accountability and legitimacy, erode trust in government, and hinder citizen engagement and government performance. Previously, Jakarta's local governments lacked government transparency, holding high-level meetings under a close-door policy, sustaining a critical and fundamental flaw in policy-making and fueling government inefficiency and corruption. Social media radically increased the speed, reach and transparency of information. Yet, social media-enabled government transparency has not been sufficiently investigated. This research presents strategic use of YouTube by Jakarta's new local government to "open doors" to high-level political meetings and other reform-oriented government activities for greater local government transparency. We conducted an analysis of 250 government-generated videos on YouTube viewed and liked by Jakarta's 7.8-million net-savvy citizens. We conclude transformational leadership's political will and strategic use of YouTube are the keys to advancing local government transparency and facilitating citizen engagement with government's reform initiatives.

Keywords: Local government transparency, social media-enabled transparency, YouTube, bureaucratic reform process, political will, net-savvy citizens.

1 Introduction

Government transparency is critically important to cut government bureaucracies and corruptions. Government bureaucracy and corruption diminish political accountability and legitimacy [19], erode trust in government [14, 19], discourage citizen engagement [12, 19] and hinder government performance, including the provision of effective and efficient public services [14]. Berlin-based Transparency International found that two-thirds of countries being surveyed had the Corruption Perceived Index (CPI) below 50, indicating a serious corruption problem [28]. With the 2012 CPI of 32, Indonesia faces a very serious corruption problem. Indonesia's central government has identified bureaucratic reform and governance as the top priority of

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 26–37, 2013.

national development in 2013 [23]. While the central government did not specifically mention government transparency, Jakarta's new local government won the 2012 elections by promoting "The New Jakarta" to create a transparent local government that can deliver citizen-centric public services through bureaucratic reforms and corruption eradication. Previously, Jakarta's local governments held high-level political meetings under a closed-door policy, sustaining a critical and fundamental flaw in policy-making and fueling government inefficiency and corruption.

The effects of government transparency have been heavily examined in the literature [11, 16, 20]. The e-government research has also emerged to examine the potential benefits of social media to promote government transparency [3, 17, 22]. Yet there has been very little research focusing on how government actually promotes transparency and how government transparency is communicated to citizens for their support in the process of bureaucratic reforms. Social media have radically increased the speed, reach and transparency of information [25]. Yet, the power of social media in government to facilitate and advance government transparency has not been sufficiently investigated. This research, therefore, aims to answer the following central question*: How does government use social media tools to advance and communicate local government transparency?* In this exploratory empirical study, we conducted a content analysis of 250 Jakarta's local government-generated YouTube videos, which were viewed and highly rated by Jakarta's 7.8 million net-savvy citizens. Based on our analysis results, we conclude that both the new transformational leadership's political will to achieve its reform visions and its strategic use of YouTube as a mechanism for communicating bureaucratic reforms in action are the keys to advancing local government transparency and facilitating citizen engagement with government's reform initiatives.

The remainder of this paper is structured as follows: Section 2 reviews the literature on bureaucratic reform, government transparency and social media-enabled government transparency. Section 3 presents a brief research context on government corruption in Indonesia and Jakarta's new local government inaugurated in October, 2012. Section 4 presents our central research question and describes our research methodology on sampling and content analysis of government-generated YouTube videos. Section 5 presents key findings of our analysis of 250 YouTube videos. Section 6 presents our discussion and the conclusion of this study, including our research limitations and future research directions.

2 Literature Review

2.1 Bureaucratic Reform

Government bureaucracy and corruption diminish political accountability and legitimacy [19], erode trust in government [14, 19], discourage citizen engagement [12, 19] and hinder government performance, including the provision of effective and efficient public services [14]. When a new government is elected, a key factor influencing its success is the degree to which it can establish legitimacy among its citizens [9, 19]. New governments often initiate bureaucratic (or administrative) reforms for legitimacy or other reasons when their previous governments' bureaucracies and corruptions have been public issues. Bureaucratic reform in the

context of government performance and new public management involves transforming government through strategic objectives of cutting the bureaucratic inefficiency and corruption and improving government responsiveness to citizen demands. Empirical studies show that bureaucratic reforms require institutional transformation, such as new transformational leadership [18], strategic use of e-government (or ICTs in government) and citizen participation [1, 3, 18]. The literature suggests that bureaucratic reform initiatives need institutional, technological and/or social mechanisms for producing desired outcomes.

2.2 Government Transparency

In recent years there has been an increased interest in the institutional, social and economic determinants and the effects of government transparency. While conceptions of government transparency and their study focuses are diverse, government transparency encompasses policy-making transparency, openness of political process and public service programs priority transparency [10, 15, 26, 30]. Specifically, an empirical research on the effects of public service reform found that the institution's act of adopting administrative reform by itself produced the beneficial impact on government transparency in new Eastern European democracies [21]. Survey studies in East Central Europe explained variation in local government transparency as a function of the institutions, as opposed to socioeconomic development or locality size [8]. In another cross-national study, regression analysis found that telecommunications infrastructure and free press influenced the perceptions of government transparency in a positive and significant way [24]. Similarly, citizens' online information-seeking was positively associated with their increased support for government transparency [7] and citizens' e-participation seemed to be positively related to their assessment of local government transparency and their trust in government [16]. Despite the increased interest in government transparency, however, there has been very little research focusing on the mechanisms for advancing and communicating government transparency to stakeholders. Finally, studies on local government transparency are still very limited [26].

2.3 Social Media-Enabled Government Transparency

Open government policies, such as the US Open Government Directive [29], aim to create a new culture of openness in government for achieving greater government transparency, citizen participation and inter-agency collaboration through social media use in government. The policies acknowledge the rapid technological changes in societies across the globe. Social media, with the proliferation of multimedia data as well as multimedia mobile devices, including laptops, tablets, iPods, and smart phones, have become increasingly integrated in citizens' daily lives. In this dynamically changed information environment, "the political power of social media" [25] in providing new forms of organizing active forms of citizen political engagement was demonstrated during recent political upheavals that, for example, toppled dictatorial regimes in the Arab world. Social media in the hands of networked citizens who have no hierarchical organization have facilitated the leaderless 'social media revolution' in the turbulent aftermath of the 2009 Iranian Presidential election [6].

With regard to social media-enabled government transparency, e-government research on social media in government is emerging but still new. One of its first studies examined the ways in which social media and advanced ICTs were integrated into collaborative e-government initiatives at the state government level to facilitate greater government transparency [4]. However, the maturity of social media-mediated local government transparency is still at its very early stage [5]. There are institutional barriers to implementing a culture of government transparency. Not only the effective use of social media [12] but also political will of government leadership must be mobilized to overcome these challenges [3].

3 Research Context: Jakarta's New Local Government

3.1 Government Corruption

Like many developing countries, Indonesia has been fighting a serious government corruption problem. It is public knowledge that politicians and public administrators have been engaging in wide-spread corruptive practices for their personal gains. Berlin-based Transparency International, a non-profit organization for the global coalition against corruption, uses Corruption Perceptions Index (CPI) to measure the level of government corruption in a given country. The CPI measures countries on a scale from 0 for highly corrupt to 100 for very clean. While no country has a perfect score, two-thirds of countries being surveyed have the CPI below 50, which indicates a serious corruption problem. Indonesia scored 32 on the scale in 2012 [28], indicating a very serious corruption problem.

3.2 "The New Jakarta": Transparency, Reforms and Corruption Eradication

In terms of government structure, the province is the highest level of local government hierarchies in Indonesia. Provinces are broken down further into regencies and cities. Jakarta as a providence is officially known as the Special Capital Region of Jakarta, which geographically encompasses a regency and five cities. However, public services in the Special Capital Region of Jakarta are centralized, with government agencies such as public housing and public transportation to provide public services to all the people in the Special Capital Region of Jakarta. With its metropolitan population of over 28 million, Jakarta is not only the capital city but also the largest city and primary port city in Indonesia. Jakarta is the third largest city in the world based on metropolitan population [2]. As the economic center of Indonesia, Jakarta generates approximately 70% of Indonesia's capital flows.

On September 29, 2012, Joko Widodo and Basuki Tjahaja Purnama were elected as the Governor and the Deputy Governor respectively for the local government in Jakarta. The Governor won the second-round voting despite his absolute lack of experience in either national or state-level politics. Traditionally, the Governors of the Special Capital Region of Jakarta descended from Indonesian military or high politics. The Governor was the Mayor of Surakarta (a small city in the Java Island), whereas the Deputy Governor was the head of Belitung Regency (a small island in the Sumatra region). They (and the coalition of two political parties) won the second-round election over the incumbent who built his career in Jakarta politics since 1987,

by promoting their shared reform visions, "The New Jakarta" ("Jakarta Baru" in Indonesian), during the gubernatorial elections campaign. It promised the provision of citizen-centric public services through greater local government transparency and cuts in bureaucracies to improve government performance [13]. It also promised that the Governor would spend one hour in his office and the rest of the time for site visits to identify the bureaucratic inefficiency and corruption problems, provide timely decision-making and closely monitor government performance and quality.

4 Research Methodology

This exploratory empirical research was undertaken in the context of Jakarta's new local government to examine the following central question*: How does government use social media tools to advance and communicate local government transparency?* As of March 17, 2013, Jakarta's new local government has uploaded a total of 473 government-generated videos on YouTube since its inauguration on October 15, 2012. YouTube is a video-sharing social media channel operated as a Google subsidiary since 2006. While unregistered users can view videos, registered users – individuals, media corporations and other organizations – can upload, view and share a wide variety of user-generated video content [31]. In this research we collected Jakarta's new local government-generated videos uploaded on YouTube through its YouTube account "PemprovDKI". The period of data collection was limited to 80 days from the inauguration day to January 3, 2013. The crawler retrieved information on both the number of uploaded government videos and viewers of the government-generated YouTube videos through the YouTube API.

During the data collection period, 266 government-generated videos were uploaded on YouTube, all of which showed the video title, with the same format: [upload date] [actor] [activity] [part]. The [part] was occasionally used to show long videos as separate parts. In this research, each part of a video is treated as a single video because it shows its own viewer-generated comments, rating and number of viewers. Four videos on inauguration and twelve videos showing other actors were excluded from analysis. Using the information contained in the video title, we selected a sample of 250 videos which showed the Governor and/or the Deputy Governor as actor(s) for analysis, because they are the two key drivers for "The New Jakarta" reform visions. We then classified political activities shown in the 250 YouTube videos into categories. For each of the categories, we collected statistics on videos and viewers. Of the political activity categories, we conducted a content analysis of "High-Level Political Meetings" category videos to identify the government's key political issues.

5 Analysis Results

5.1 New Local Government's Strategic Use of YouTube

The new leaders in Jakarta demonstrated strong political will to advance their shared reform visions by engaging in rapid-fire, energetic political activities: high-level political meetings with internal and external stakeholders and site visits with local citizens and government officials alike for fact-finding at various parts of the city.

They then made strategic use of YouTube video-sharing social media channel to capture and communicate their reform-oriented political activities to Jakarta's net-savvy citizens. Only two days after the Governor and the Deputy Governor were inaugurated, government-generated videos were uploaded on YouTube. All the videos show the Special Capital Region of Jakarta logo at the upper-right corner on video frames. Through the strategic use of YouTube, the local government aimed to "open doors" to its net-savvy citizens who could view the YouTube videos and assess the new leadership efforts to make government policy-making governance and political actions transparent. The videos were shot, accompanied by narration in the form of audio and/or captions and uploaded without a video frame edit. On one hand, no video frame editing can be viewed as a reflection on the new leadership's political will to demonstrate government transparency. On the other hand, the videos showing idle activities made the duration of the YouTube videos longer than necessary.

5.2 Reform-Oriented Political Activities Captured in YouTube Videos

On average, 3.1 videos per day were uploaded during our data collection period of 80 days. Political activities captured in the sample of 250 videos on YouTube were classified into seven categories:

- *High-Level Political Meetings* refer to high-level internal meetings with internal and/or external stakeholders (e.g. policy makers, politicians, decision makers and senior public administrators) to discuss key political issues of interest to the public from perspectives of "The New Jakarta" reform visions.
- *Community Engagement* activities aim to promote informal social interactions and exchanges between the Governor (or less frequently, the Deputy Governor) and local citizens through community events.
- *Site Visits* are defined as direct observation activities for face-to-face fact-finding with citizens and government officials alike, engaged by the Governor (or on rare occasions by the Deputy Governor) outside his Executive Office.
- *Press/Media Conferences* refer to news media interviews given by either the Governor or the Deputy Governor.
- *Ceremonies* include activities of the government officials who represent the local government in sponsoring an official ceremonious event.
- *Public Speeches* include invited keynote speeches delivered by the Governor or the Deputy Governor at seminars and workshops.
- *Making/Hosting Honorary Visits* include official gubernatorial visits to a place or an event to represent the government to interact with other parties or agencies, as well as official gubernatorial receptions for other parties or agencies.

Of the seven categories, we consider *High-level Political Meetings*, *Community Engagement* and *Site Visits* clearly as bureaucratic reform-oriented political activities, whereas *Ceremonies* and *Hosting/Making Honorary Visits* are not reform-oriented in nature. *Press/Media Conferences* and *Public Speeches* are mixed in terms of reform-oriented activities that were briefed or explained during the media interviews.

Our analysis results on the 250 YouTube videos about the category of political activities are shown in Figure 1. Overall, the top four activities shown in the YouTube videos are: *High-Level Political Meetings* (90/250 videos, 36%), *Community*

Engagement (77/250 videos, 31%), *Site Visits* (33/250 videos, 13%) and *Press/Media Conferences* (33/250, 13%). On the one hand, the Governor still has engaged in the traditional gubernatorial activities such as *Ceremonies* and *Making/Hosting Honorary Visits and Making Honorary Visits*. However, these activities accounted for only 5% of the activities shown in the 250 videos. These traditional gubernatorial activities do not add value towards advancing the new local government's strategic visions for bureaucratic reform and corruption eradication.

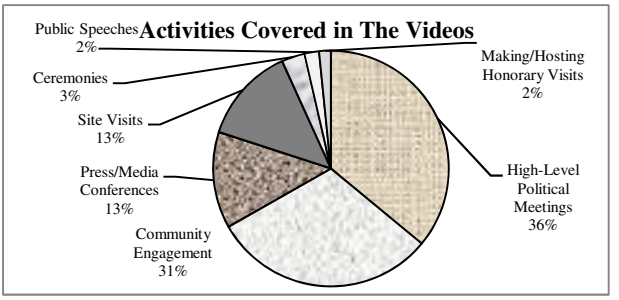

Fig. 1. Activities Captured in the Government-Generated Videos on YouTube

On the other hand, the Governor has engaged in the new and radically different political activities, such as:

- YouTube-hosted "open doors" high-level political meetings were held in which he raised pointed questions about some of the unrealistic budget proposals, corruption issues and political reforms.
- The Governor made his site visits to Jakarta's "Marunda Flat", apartment building blocks for the poor, with a recurring problem of very low-level occupancy rates among the poor.
- The Governor made his site visits to the local government's Corruption Eradication Commission to call their involvement in monitoring the government budget misuse problem and implementing budget transparency.
- The Governor visited local communities and participated in social events for community engagement and listened to the citizens' views and concerns.

5.3 Statistics on Government-Generated YouTube Videos

Descriptive statistics on the 250 government-generated videos on YouTube are shown in Table 1 below. For each category of political activities captured in the videos, Table 1 shows the number of YouTube videos (and percentage), the average length of a YouTube video (in seconds), the average number of viewers, the average number of viewer-generated comments per video and the average viewer-generated rating of a video. Our analysis results shown in the second column of Table 1 were graphically presented in Figure 1 above. The third column of Table 1 shows that the longest average duration of videos is 3,194 seconds (or 53 minutes) for the *High-Level Political Meetings'* videos, whereas the shortest average duration is 485 seconds (or 8 minutes) for the *Press/Media Conferences* category. The average duration of the 250 videos across the categories is 1,862 seconds (or 31 minutes). The local government-

generated videos across all the categories, except the *Press/Media Conferences* category, are much longer than the norm of YouTube video length. A large-scale analysis of 2.5 million unique YouTube videos found that the average length of a YouTube video was 4 minutes and 12 seconds [27]. The remaining columns of Table 1 present statistics on the video viewers which will be discussed in the next section.

Table 1. Statistics on the 250 Government-Generated YouTube Videos

Activities	Number of YouTube Videos (%)	Average Length of a Video (in seconds)	Avg. Number of Viewers	Avg. Viewer-Generated Comments per Video	Avg. Viewer-Generated Rating of a Video
High-Level Political Meetings	90 (36%)	3,194	48,773	310	4.96
Community Engagement	77 (31%)	2,195	29,161	268	4.98
Site Visits	33 (13%)	1,183	21,022	212	4.95
Press/Media Conferences	33 (13%)	485	17,044	222	4.97
Ceremonies	8 (3%)	2,513	16,214	130	4.98
Public Speeches	5 (2%)	2,600	24,296	379	4.97
Making/Hosting Honorary Visits	4 (2%)	1,134	15,936	226	4.94
Total	**250 (100%)**		**7,815,549**		

5.4 Statistics on Net-Savvy Viewers of the Government YouTube Videos

The 250 government-generated YouTube videos attracted a total of 7,815,549 viewers during the 80-day data collection period of this research. Descriptive statistics on Jakarta's net-savvy citizens who viewed the government-generated YouTube videos are shown in the columns 4-5 of Table 1. Given the vast array of other users-generated videos available on YouTube for choice, we argue that the average number of viewers for the category may be used as a proxy for measuring the level of citizen interest and participation in the category of political activities captured by the government-generated videos on YouTube.

We found that the *High-Level Political Meetings*, the *Community Engagement* and the *Site Visits* categories attracted the highest (48,773), the second highest (29,161) and the fourth highest (21,022) average number of viewers. As we discussed earlier, videos in these three categories show the political activities that are bureaucratic reform-oriented. We also found that the *Public Speeches* category received the third highest average number of viewers (24,296), even though it is not reform-oriented and the number of videos was only 5. One of the videos showed that the Governor, who had been criticized by the oppositions for his lack of national and state-level public administration and political experiences, represented the Office of the Governor of Jakarta Capital Region when he interacted competently and confidently with Singapore's ambassadors and diplomats. Jakarta's net-savvy citizens must have liked these videos.

An analysis on the average number of viewer-generated comments per video showed that the *High-Level Political Meetings* and the *Site Visits* generated the second (310) and the third (268) highest comments per video from the viewers. These two categories are bureaucratic reform-oriented. In contrast, one of the non-reform categories, the *Public Speeches*, attracted the highest average number of viewer-generated comments per video. Finally, YouTube video-sharing website provides users with a video rating function. All categories of political activities received an excellent average rating (out of the maximum of 5.0). Ratings ranged from 4.94 for the Ceremonies category to 4.98 for the Site Visits and the Press/Media Conferences categories. The overall high-level ratings mean that the viewers would recommend their friends to view the government-generated YouTube videos.

5.5 Issues Captured in the High-Level Political Meetings Category

We performed a content analysis of the 90 videos classified into the *High-Level Political Meetings* category to identify key issues captured and communicated by the local government. Figure 2 shows our analysis results. We found four categories of political issues: *Bureaucratic Reform and Governance*, *Budget Transparency*, *Investment Climate Improvement* and *Corruption Eradication*. There are 47 videos (or 52%) in which *bureaucratic reform and governance* issues were discussed. A prime example is a video in which the Governor told the Mayors and Heads of Districts and Sub Districts at the meeting about the need to transform the ways which they interact with local citizens, by adopting a new mindset of a public servant, away from their bureaucratic mindset. In another video, the Deputy Governor had a series of meetings with several government agencies in healthcare services for radically improving healthcare access for the poor through the new "Jakarta Health Card" program. The Deputy Governor discussed the coherent and fair governance structure and processes for enhancing agency readiness for the Jakarta Health Card program, which was one of his campaign promises. The governance structure and processes for better inter-agency cooperation seem to reflect the new local government leadership's political will to better respond to the citizen needs.

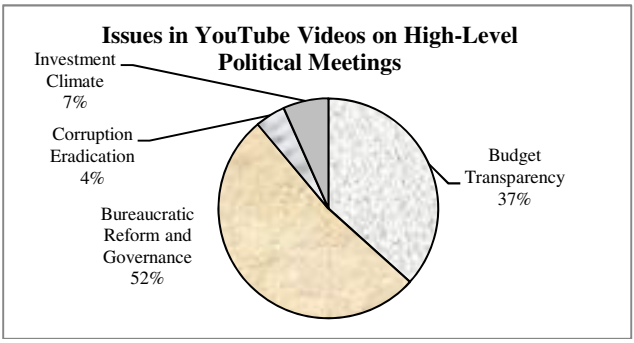

Fig. 2. Issues in the High-Level Political Meetings category videos

There are 33 videos (37%) in which the 2013 *budget transparency* issues were discussed. A prime example is a video which was viewed by 1,470,188 viewers. In this video the Deputy Governor discussed 25% deep cuts in the 2013 budget proposed

from the Department of Civil Works and others. In other videos, the Governor and the Deputy Governor discussed the priority programs for the 2013 budget at the parliament. These videos made the political decision making process transparent regarding the priority programs and the budget allocation. There are 6 videos (or 7%) in which *investment climate* issues were discussed. A prime example is a video in which the Deputy Governor met with the labor union representatives during their street demonstration on October 24, 2012. The Deputy Governor discussed their demand for the 40% regional minimum wage increase, which generated strong responses from 90 companies in Jakarta, indicating the intent to move their investments out of Jakarta. Other videos show the Deputy Governor's meetings with businesses to create a new investment climate of transparency through a new public service office, "One Stop Service," to facilitate new business investment in Jakarta. Finally, there are 4 videos (4%) in the *High-Level Political Meetings* category in which *corruption eradication* issues were discussed. A prime example is a video in which the Governor visited the Corruption Eradication Commission (KPK) to discuss new measures for identifying the potential government corruption based on the KPK's analysis of the proposed 2013 budget. The Governor also discussed the KPK recommendations for better procurement process, better fraud reporting mechanism and enhanced public information access regarding government fraud cases. Another video shows the Governor's meeting with the Audit Board of Republic Indonesia (BPK) regarding the implementation of a new "e-audit" system for the local government. Using the e-audit, The BPK argued for the new "e-audit" as ICT tools for detecting budget misuse or corruption.

6 Discussion and Conclusion

In this exploratory empirical research, we have addressed the central research question: *How does government use social media tools to advance and communicate local government transparency?* Our analysis results show that the local government-generated YouTube videos captured and dynamically communicated the new government's central message on greater local government transparency. Much of the leaders' political activities captured in the videos are value-adding towards advancing their shared reform visions of "The New Jakarta." This central message seemed to be well received, as the analysis results show that a total of 7.8 million net-savvy citizens viewed and highly rated the videos during our data collection period of 80 days. The viewer-generated comments and ratings suggest that the bureaucratic reform process and the necessary political activities to achieve the reforms were made visible, transparent and comprehensible to the net-savvy citizens through the visualization power of YouTube.

However, we argue that social media tools by themselves are not sufficient to demonstrate local government transparency. Jakarta's new local government leadership signalled and communicated strong political will to fulfil their "New Jakarta" visions through its rapid-fire reform-oriented political activities. Leadership's strong political will is important to align their political activities with the shared reform visions they promised during the elections campaign. Leaders also play a critical role in governing the government's strategic communication: what information is produced and communicated to citizens in the manner which is in

alignment with their reform visions. The inclusion or exclusion of certain attributes in content has important implications for signaling government transparency to stakeholders and building public trust in government. This new social media-enabled government transparency is radically different from the traditional Jakarta politics where high-level political meetings were held under a closed-door policy and the Governors engaged in non-value adding political activities.

Based on our analysis results we conclude that two enabling factors are important to increase transparency in government. Transformational leadership's strong political will to advancing its reform visions and YouTube tools for capturing and dynamically communicating reform-oriented political activities are the keys to advancing local government transparency and gaining the support from net-savvy citizens. This exploratory empirical research contributes to the emerging literature on social media-enabled local government transparency. As discussed, very little has been written in the political science and public administration literatures about effective mechanisms for advancing and communicating government transparency to stakeholders. Particularly, studies on local government transparency are still very limited [26]. E-government research on social media-enabled government transparency is emerging but still new [3-5, 12]. In this exploratory empirical research, we have addressed this research gap in understanding how governments are using social media to promote transparency and increase citizens' awareness and understanding of their reform activities. Our research limitations include our research attention on transformational leadership behavior as well as our limited data collection period of 80 days. Our future research directions include a longitudinal study of government-generated videos on YouTube and reviewer-generated comments and ratings to observe the potential changes in communicating local government transparency over a period of time.

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A Coordination Theory Perspective to Improve the Use of Open Data in Policy-Making

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Abstract. At this moment there is little coordination of the publication and use of open data. In this research coordination needs and challenges for open data and coordination mechanisms that can help in improving coordination are identified. A literature review shows that the opening and use of data are isolated and unrelated processes. Open data publishers do not profit from the wisdom of the crowd by having knowledge of how their data are reused. In addition, results of data reuse are not discussed and little feedback is gained by data providers, in this way barely supporting policy and decision-making. Coordination mechanisms, such as standardization and interconnected processes, can enable open data providers to profit from publishing data and to use this for improving their policy-making and decision-making. Yet, it is difficult to coordinate the open data process with these coordination mechanisms due to the complexity, lack of structure, uncertainty, dynamism, and the involvement of varying stakeholders in the open data process. Further research is necessary to investigate which coordination mechanisms are appropriate in the context of open data publication and use.

Keywords: open data, coordination, coordination theory, coordination mechanisms, challenges, improvement, open data process.

1 Introduction

The open data process consists of many activities that are performed by different stakeholders [1, 2]. Following [3] and [4], we define the open data process as all activities between the moment that data are starting to be created and the moment that data are being discussed, including the activities to publish, find and use open data. At least open data publishers and users are involved, but often many more stakeholders are involved, such as open data facilitators, brokers (e.g. organizations that bring together open data users and producers by providing open data websites) and open data legislators (e.g. the European Commission and national political parties).

The intention of open data publication is to make data available to have them reused by external users, in this way profiting from the wisdom of the crowd, and subsequently to support and improve policy-making and decision-making by discussing data and providing feedback to open data providers. However, as stated by

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 38–49, 2013.

Braunschweig et al., activities of the open data community are largely uncoordinated [2]. This statement is based on a survey of open data platforms, focusing on the technical aspects using open data, but not focusing on other parts of the open data process. Open data publishers are often unaware of what is done with the data, which value they can create and how they can be used for improving their own policies and decisions. Open data publishers and users are often not aware of each other's needs and activities. For instance, many open data providers are primarily focused on making data available and do not know which format is preferred by users and how the way that they publish data can stimulate the use of open data. Stimulating the use of open data is an important factor in creating the intended effects [5]. Coordination is important, because it may lead to increased understanding of the open data process and could result in concerted action [6], improved performance [7, 8] and improved policies. In addition, it can help to accomplish advantages, such as increased transparency [9, 10], economic growth and innovation [10, 11], empowerment of open data user [9, 12] and improvement of policy and decision making [9, 10].

This research aims to 1) determine which coordination needs and challenges exist in the open data process and 2) to investigate how coordination in the open data process can be improved. A literature review is performed to examine coordination theory and to define coordination. On the basis of concepts derived from the literature and an analysis of interdependencies between activities in the open data process, coordination needs and challenges are identified. Finally, coordination mechanisms are described to deal with the coordination challenges and to improve coordination in the open data process.

2 Coordination Theory

In this section background information is given about how coordination can be defined (Section 2.1) and which coordination mechanisms are identified in the literature to improve coordination (Section 2.2).

2.1 Coordination

Coordination theory provides an approach to the study of processes [13] and has been studied in numerous disciplines, such as computer science, sociology, political science and management science [14]. Although we all have an intuitive sense of what the word 'coordination' means, debate has been going on for years about what it really is. According to Van de Ven, Delbecq and Koenig [15, p. 322], "coordination means integrating or linking together different parts of an organization to accomplish a collective set of tasks." Heath and Staudenmayer [16, p. 156] state that coordination in organizations refers to "organizing individuals so that their actions are aligned". In line with these definitions, Thompson [17, p. 37], postulates that coordination means that "the elements in the system are somehow brought into an alignment, considered and made to act together".

From this perspective, the division of labour in organizations leads to the need for coordination, as interdependencies between tasks and the individuals performing them need to be coordinated [16]. For this reason, Malone and Crowston [14, p. 361, 18]

define coordination as "the act of managing interdependencies between activities performed to achieve a goal". In line with this, Gosain, Lee and Kim [19, p. 372] define coordination as "a process of linking together different activities of organizations to accomplish a common goal". Coordination is thus needed to map goals to activities, relate activities performed by different actors and to manage the interdependencies between these activities [14, 18].

In this research, interdependence is viewed as the extent to which activities in the open data process require the elements, such as the actors, systems and divisions, to work together [20, 21]. The management of interdependencies between activities could result in the alignment of actions of stakeholders in the open data process and in this way result in coordination.

2.2 Coordination Mechanisms

Coordination, i.e. the management of interdependencies between activities, can be achieved by coordination mechanisms. On the basis of the work of March and Simon [22], Thompson [6] expounds three types of coordination mechanisms. First, coordination by standardization refers to the development of routines or rules, which constrain action of each organizational part or position. This type of coordination requires an internally consistent set of rules and a stable and repetitive situation to be coordinated [6]. Second, coordination by plan requires a lower degree of stability and routines than coordination by standardization and refers to the creation of schedules for interdependent organizational parts. These schedules may govern their actions and they are appropriate for dynamic situations, such as changing tasks [6, 22]. Third, *coordination by mutual adjustment* is suitable for reciprocal interdependence. This type of coordination needs most communication and decisions, as it "involves the transmission of new information during the process of action" [p. 56]. Coordination by mutual adjustment is possible for variable and unpredictable situations [6]. March and Simon [22] refer to this as *coordination by feedback.*

Also based on March and Simon's [22] work, Gosain, Malhotra and El Sawy [23] argue that in an inter-enterprise setting, coordination outcomes can be achieved by combining advanced structuring and a dynamic adjustment approach. Advanced structuring refers to structuring information flows and interconnected processes that exist between organizations before they take place (i.e. in advance). The advantage of this approach is that the effort related to adjusting to changing environments is reduced. Advanced structuring makes use of 'loose coupling', which means that certain elements of systems are linked (i.e. "coupled") to attain some degree of structuring, while spontaneous change may occur, leading to a certain degree of independence (i.e. "looseness"). Gosain et al. (2004) identified three aspects that advance the 'coupling' and looseness' in the advanced structuring approach. First, standardization of process and content interfaces concerns "explicit or implicit agreement on common specifications for information exchange formats, data repositories, and processing tasks at the interfaces between interacting supply chain partners" [23, p. 14]. Second, modular interconnected processes, which means "the breaking up of complex processes into sub processes (activities) that are performed by different organizations independently (such that sub processes occur through

overlapping phases, or better still, fully simultaneously) with clearly specified interlinked outputs" [p. 16]. Third, structured data connectivity refers to "the ability to exchange structured transaction data and content with another enterprise in electronic form" [p. 17].

The dynamic adjustment approach refers to effectively and quickly reconfiguring interorganizational processes, so that these processes become appropriate for a changed organizational environment. The reconfiguration is supported through (IT) learning and adaptation [23]. Aspects that advance the dynamic adjustment approach are 1) the breadth of information shared with supply chain partners, 2) the quality of information shared with supply chain partners and 3) deep coordination-related knowledge. Breadth of shared information is required to react to unexpected change, while information of high quality is needed to make effective and efficient inferences. Deep coordination-related knowledge consists of knowledge of partner competencies, process and content, organization memory of past change episodes and understanding of causal linkages [23].

3 Coordination Needs and Challenges in the Open Data Process

In the previous section it was stated that coordination refers to the management of interdependencies between activities [14, 18]. Crowston [24] argues that "to analyze an organizational process, it is important to identify the dependencies that arise and the coordination mechanisms that are used to manage those dependencies" (p. 86). In this section, we elaborate on the need to coordinate the open data process (Section 3.1) and analyze interdependencies to determine which coordination challenges currently exist (Section 3.2).

3.1 Coordination Needs

Project and organization complexities, interdependencies in work activities and uncertainty in the environment of the organization lead to a need for coordination [19]. Realizing coordination in the open data process is important, as coordinating by tightly coupling relationships provides the advantage to jointly exploit the capabilities of process partners [25, 26]. For instance, open data providers can use the wisdom of open data users to discuss their data. Moreover, coordination may lead to an increased understanding of the open data process and could result in concerted action [6] and improved performance [7, 8].

In the open data process, concerted action of the actors could deal with the complexities, interdependencies and uncertainties and stimulate the realization of benefits of the open data process [27]. For instance, to achieve economic growth, providers of open data should take into account the needs of open data users, such as needs for certain data formats or metadata, and they should actively discuss those needs, so ensure that open data will actually be used. Furthermore, to improve public policies and policy and decision making, open data users can communicate with open data providers about the way that they used open data and to recommend policy improvements. Thus, there is a need for coordination in the open data process.

3.2 Coordination Challenges

As there is a need for coordination in the open data process, it is important to identify the coordination challenges that currently exist. We define a coordination challenge as a situation in which a goal is defined, but coordination (i.e. the act of managing interdependencies between activities performed to achieve this goal) is inappropriate. We refer to Figure 1 to show in which part of the open data process the challenges exist. Each number in the figure refers to a challenge that is described thereafter.

As Figure 1 shows, the current open data process is characterized by four main activities. First, data are created by governmental and non-governmental organizations. Second, these organizations can decide to publish the created data on the internet. Third, the published data can be found by (potential) users, such as researchers and citizens. And, fourth, the found data can be used.

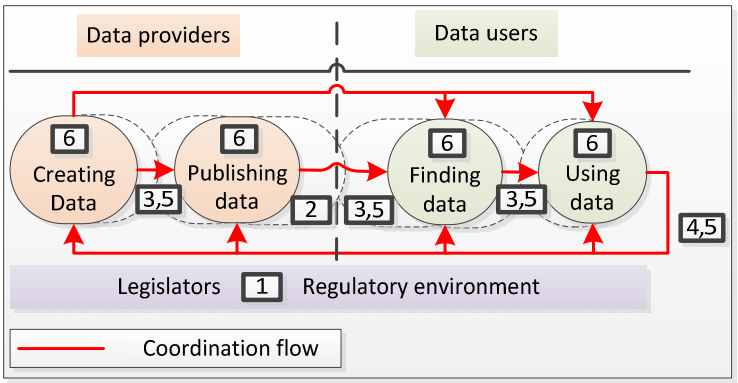

Fig. 1. Coordination challenges in the open data process

1. Inappropriate regulatory environment (challenge 1 in Figure 1)

Actors: Open data legislators, providers and users.

Activity goal: To publish data in such a way that they can be reused by external users, in this way profiting from the wisdom of the crowd, and subsequently to support and improve policy-making and decision-making by discussing data and providing feedback to open data providers.

Interdependence: The way that the open data provider makes data available highly influences the way that external users can make use of the data. As a consequence, this influences the type of feedback that open data providers can obtain from the crowd and the way that they can apply this feedback to their own processes, such as policy-making and decision-making.

Coordination mechanisms: There are only limited coordination mechanisms in the form of legal frameworks, policies and guidelines. Although coordination by plan is applied to the open data process in the form of legislation, open data policies and organizational guidelines, these mechanisms provide little improvement of coordination in the open data process. There are many differences among open data legislation and policies, for instance with regard to policy objectives and policy instruments, and there are many opportunities for improving open data policies [5]. Additionally, the legal frameworks, policies and guidelines do not refer to standards or plans that reflect what users need or how the data provider can obtain feedback from its own data.

2. Fragmentation of open data (challenge 2 in Figure 1)

Actor: Open data providers.
Activity goal: Open data providers aim to publish data in such a way that the data can be found and reused easily, so that the advantages of open data can be realized.
Interdependence: The ease of finding open data influences the way that open data can be reused effectively. When the data cannot be found easily, they are less likely to be reused and the benefits of open data are not fully realized.
Coordination mechanisms: Open data are fragmented, which makes it difficult to find them. One reason for this is that data are published via various open data platforms. Even though some catalogues exist, describing which data can be found on different open data platforms, these catalogues are incomplete and usually not linked to other catalogues. In addition, there is no overview of who creates which data. As a consequence, open data users often do not know where they can find the data that they want to use.

3. Unclear boundaries of responsibilities (challenge 3 in Figure 1)

Actor: Open data providers and users.
Activity goal: Clearly define the boundaries of responsibilities of open data providers and users, so that they know what they can expect from each other and use this information to effectively execute their processes.
Interdependence: Open data providers and users adapt themselves to the information and knowledge that they have about the boundaries of their own responsibilities and the responsibilities of the other stakeholders in the open data process to effectively perform their work.
Coordination mechanisms: The boundaries of the responsibilities of stakeholders in the open data process are often unclear. There is no widely accepted agreement about which stakeholders perform which activities. Furthermore, there is no coordinator who is responsible for the whole open data process. A cause of this boundary uncertainty could be that stakeholders in the open data process lack information concerning each other's status and activities and that different organizational units observe different parts of the process [28].

4. Lack of feedback on and discussion of data use (challenge 4 in Figure 1)

Actor: Open data providers and open data users.
Activity goal: To discuss with other stakeholders in the open data process and to provide them with feedback on their activities.
Interdependence: Applying discussion and feedback mechanisms in the open data process is important, as they can be beneficial for data providers as well as data users. Open data providers and users can use discussion and feedback mechanisms to improve the quality of the data, the data publishing processes and open data and other policies. Additionally, they can help users to better understand how they can use and interpret data and what the value of the data is [29].
Applied coordination mechanisms: The current open data process is lacking discussion and feedback mechanisms. For instance, after open data have been used, there are usually no coordination mechanisms that facilitate the provision of feedback to data providers and that facilitate a discussion about the reused data.

5. Lack of interconnected processes (challenge 5 in Figure 1)

Actor: Open data providers and users.
Activity goal: Connect sub processes of the open data process, so that open data providers and users can gear the activities that they perform to one another.
Interdependence: The open data process is divided into main processes, which can be divided into sub processes. An example of such a sub process is the preparation of the dataset or checking whether the dataset can be published. The way that stakeholders perform their activities influences the extent to which other stakeholders are able to perform their activities in other sub processes. A lack of interconnected processes can lead to the situation in which one stakeholder executes activities in such a way that other stakeholders are hindered in performing their own activities. For instance, when a data provider does not have the insight that open data users need considerable metadata to be able to use the data, he or she may not provide these metadata and hinders the open data user to use the data and realize their benefits.
Coordination mechanisms: The sub processes in the open data process usually do not have clearly specified interlinked outputs. The coordination mechanism of deep coordination-related knowledge, including knowledge of partner competencies, process and content, organization memory of past change episodes and understanding of causal linkages, is lacking in the open data process. For example, many organizations merely release data on the internet without considering the way that their data can be used or how they can get feedback on the data [30].

6. Lack of standardized and planned processes (challenge 6 in Figure 1)

Actor: Open data providers and open data users.
Activity goal: To perform the open data process in a standardized way.
Interdependence: The extent of standardization used in the open data process influences easiness, time-consumption and efficiency to participate in it.
Coordination mechanisms: The mechanisms of coordination by standardization and coordination by plan are barely applied in the open data process. This may be caused by the fact that the sub processes of the open data process are not stable and sometimes not repetitive, which makes it difficult to apply coordination by standardization and plan. For instance, open data can be published and reused in various ways and feedback can be provided and received in many ways. This finding is in line with research of Braunschweig et al. [2], who write that considerable differences exist between the ways that data can be reused in open data repositories.

4 Mechanisms to Improve Coordination in the Open Data Process

In the previous section, various coordination challenges for the open data process were identified. In this section we focus on the second aim of this paper, namely to investigate how coordination in the open data process can be improved. Table 1 shows an overview of the coordination challenges that were identified in the previous sections and the related coordination mechanisms that may help in solving these challenges.

Table 1. An overview of coordination challenges related to coordination mechanisms that may help in solving these challenges

Coordination challenges	**Coordination mechanisms to solve these challenges**
1. Inappropriate regulatory environment	Coordination by standardization, plan, deep coordination-related knowledge
2. Fragmentation of open data	Coordination by standardization, plan, structured data connectivity, deep coordination-related knowledge
3. Unclear boundaries of responsibilities	Coordination by plan, modular interconnected processes, deep coordination-related knowledge
4. Lack of feedback on and discussion of data use	Coordination by mutual adjustment, modular interconnected processes, structured data connectivity, deep coordination-related knowledge
5. Lack of interconnected processes	Coordination by standardization, plans, mutual adjustment, modular interconnected processes, structured data connectivity, breadth and quality of shared information, deep coordination-related knowledge
6. Lack of standardized and planned processes	Coordination by standardization, plan, deep coordination-related knowledge

Although the coordination mechanisms that were described by Thompson [6] and Gosain et al. [23] are only applied on a small scale in the open data process at this moment, all the coordination mechanisms that were described by them seem to be appropriate to use to improve coordination in the open data process, as all of them could be related to at least one of the identified coordination challenges. Therefore, we recommend to use the identified coordination mechanisms.

Table 1 shows that different coordination challenges might be solved by using different coordination mechanisms. For example, the lack of interconnected processes could be solved by applying all mechanisms, but solving the lack of communication would benefit mainly from coordination by mutual adjustment and deep coordination-related knowledge, rather than other mechanisms, such as the breadth and quality of shared information. Coordination by deep coordination-related knowledge could be used for all of the coordination challenges and was mentioned most often.

The second column of Table 1 shows that we propose to use a combination of coordination mechanisms from all three approaches that we analyzed, namely from Thompson's [6] approach and from Gosain et al.'s [23] approach of advanced structuring and dynamic adjustment. For instance, to solve the challenge of unclear boundaries of responsibilities, we propose to combine mechanisms from all three approaches, namely coordination by plan defined by Thompson [6], modular interconnected processes defined by Gosain et al.'s [23] approach of advanced structuring and deep coordination-related knowledge defined by Gosain et al.'s [23] approach of dynamic adjustment.

But although several useful coordination mechanisms are described in the literature, these coordination mechanisms cannot be directly applied to solve all the challenges in an appropriate way. For instance, while it is clear that fragmentation of

open data could be solved by coordination by standardization, existing research does not explain how this standardization could be applied to the open data process. It is difficult to coordinate the open data process due to its complexity, lack of structure, uncertainty, dynamism, and the involvement of many stakeholders. Because of these characteristics of the open data process, is unclear how activities in the open data process could be interconnected and how deep coordination-related knowledge could be obtained by stakeholders involved in the open data process. It is hard to define suitable coordination mechanisms in advance. In different circumstances different coordination mechanisms might be appropriate. Further research is needed to investigate whether and how coordination theory could be extended to provide more appropriate coordination mechanisms in the context of open data.

As a first step towards examining how coordination mechanisms can be applied, we suggest the development of an open data e-infrastructure where open data providers and users can find and contact each other and collaborate. Such an open data e-infrastructure has the advantage that it brings together different stakeholders who are involved in the open data process and, as a consequence, it provides an overview of these stakeholders and it gives more insight into how the open data process could be coordinated. Open data e-infrastructures may provide, among others, the functionalities of data provision, data retrieval and use, data linking, user rating and user cooperation [30]. E-infrastructure may be helpful in supporting coordination by:

- Using an Application Programming Interface (API) that allows publishers to integrate the publishing workflow in their own dataset management systems and upload or update datasets automatically on open data infrastructures.
- Interconnecting processes performed by data providers and data users, for example, by keeping track of their status from the phase of publication until the phase of data reuse and discussion;
- Describing and clarifying the responsibilities of stakeholders involved in the open data process;
- Providing deep coordination-related knowledge;
- Linking data and showing them in linked catalogues to improve their findability;
- Giving information about open data regulations (e.g. policies and guidelines);
- Enabling the discussion of reused data by making it possible for users to discuss datasets individually or in groups of users, in this way stimulating iterative open data processes;
- Enabling the provision of feedback on data and on policies;
- Enabling monitoring data reuse, data discussions and feedback on datasets and policies by providing tools to monitor these;
- Standardizing processes of uploading, downloading, reusing and discussing data, for instance by describing formats in which data could be published to facilitate their reuse [30].

5 Conclusions

The aim of this research was 1) to determine which coordination needs and challenges exist in the open data process, and 2) to investigate how coordination in the open data process can be improved. A literature review was performed, which pointed at coordination mechanisms that can be applied to improve the open data process. Subsequently, the open data process was analyzed. Interdependencies between activities were examined and it was found that some of the coordination mechanisms derived from the literature are used in the open data process, but only on a very small scale. Six different coordination challenges were identified in the open data process, namely 1) an inappropriate regulatory environment, 2) fragmentation of open data, 3) unclear boundaries of responsibilities, 4) a lack of feedback on and discussion of data use, 5) a lack of interconnected processes, and 6) a lack of standardized and planned processes.

Coordination mechanisms can be used to overcome these challenges. The use of coordination mechanisms in the open data process could stimulate the realization of the advantages of open data, such as enabling open data users to reuse data and enabling open data providers to profit from publishing data and to use this for improving their policy-making and decision-making. Yet, we found that it is difficult to coordinate the open data process due to its complexity, lack of structure, uncertainty, dynamism, and the involvement of varying stakeholders. Further research is necessary to investigate which coordination mechanisms are appropriate in the context of open data publication and use.

Acknowledgements. This paper is related to the ENGAGE FP7 Infrastructure Project (An Infrastructure for Open, Linked Governmental Data Provision Towards Research Communities and Citizens; www.engage-project.eu; www.engagedata.eu), that started in June 2011. The authors would like to thank their colleagues of the ENGAGE project for their input for this paper although the views expressed are the views of the authors and not necessarily of the project.

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Opening Moves – Drivers, Enablers and Barriers of Open Data in a Semi-public Organization

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Abstract. Governments around the world are opening up their data to increase transparency and stimulate re-use of their data. Semi-public organizations follow, but often for different purposes as they also aim to realize commercial gains with their data. Many organizations, however, find the process of opening up data cumbersome as changes need to be made to different organizational layers. This paper identifies drivers, enablers, and barriers of open data, by reviewing literature and by conducting a case study of open data in a semi-public organization in the Netherlands. We found that while the drivers for opening up data remain the same in every phase of the process, the enablers and barriers shift between the different phases. While in the beginning of the process, organizational factors such as having an implementation strategy and ensuring data quality gained much attention, this attention shifted to factors related to re-use of data. Further research should thus focus on how to develop valuable open data business models, how to foster re-use and build strategic partnerships with users.

Keywords: Open Data, Open Government, Drivers, Enablers, Barriers.

1 Introduction

Since President Obama of the United States announced his strategy for 'open government' on his first day in office [1], government organizations around the world began opening up their data. The main goals of open data for these organizations are to become more transparent and accountable to citizens [2] and to realize economic activity by stimulating re-use [3]. By now, also semi-public organizations, such as cultural heritage foundations, public transport organizations and research institutes, have jumped on the bandwagon. Although these organizations also see the benefits of transparency and re-use, their purpose of opening up data extends to enhance the value of their data for their own (commercial) purposes. They, for example, aim to commercially exploit their data or forge strategic partnerships with app developers.

While strong drivers are present spurring open data developments, many public and semi-public organizations find the process of opening up data cumbersome [4]. Many challenges remain as changes need to be made to different organizational aspects [5]. This paper investigates the process of opening up data to find out which drivers, enablers and barriers exist in organizations that open up their data to the

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 50–61, 2013.

public. By investigating a case study of a research and technology organization (RTO) in the Netherlands, this paper looks at which factors influence the process of opening up data. This paper uses a two-pronged approach. First, based on literature, we develop a framework for identification of enablers and challenges to open data. Then, using longitudinal case study research, we identify the main drivers, enablers and barriers within the RTO. When organizations have better insight in this process, they are more likely to successfully open up their data.

The next section identifies drivers, enablers and barriers of open government and open data from literature and subsequently presents an overview that can be used for the identification of factors influencing the process of opening up data. In the third section, we present the case study methodology, followed by the case study of the RTO in the fourth section. The fifth section presents and discusses the main findings from the case study. Finally, the sixth section formulates conclusions and recommendations for further research.

2 Drivers, Enablers and Barriers of Open Data

Information technologies, such as the semantic web and social media, have increased the ability to collaboratively produce, share, distribute and innovate [3]. These technologies gave rise to openness as an organizational strategy: open innovation, open source, open standards, open web platforms and, predominantly in the public sector, open government and open data. Currently, an increasing number of government agencies around the world is publishing public sector information (PSI) such as weather forecasts, legal documents, crime statistics, geospatial data, traffic data and educational data [6-8]. While PSI is traditionally published in a human-readable or proprietary format on the internet (e.g. PDF or HTML) [7,8], open data requires a machine-readable format (e.g. CSV, XML or RDF) and a minimum of juridical, economical and technical barriers to re-use the data for social or commercial purposes [9,10]. After open data strategies were put in place at the national level, the revision of the European PSI directive is currently pushing the open data movement [11]. An extension of open data is *linked data*: the semantics of the data are modelled and the data can be linked to and from external data sets [12,13].

Government agencies generally have three *driving forces* to open up their data: transparency, innovation and efficiency [6,14,15]. Firstly, open data is seen as an instrument to increase transparency and accountability [2,14], e.g. by facilitating the Freedom of Information act [15,16]. Predominantly in the US and the UK, citizens and NGOs push for open data to increase their ability to evaluate the process and performance of government agencies [3]. Secondly, open data is seen as an instrument to foster innovation [3]. The European Commission claims that a European open data strategy can lead to a yearly economic value of 70-140 billion euros in the European Union alone. The promise of open data is that re-use of PSI by private and public parties will grow, resulting in new commercial and public services [11,17]. Thirdly, open data is seen as a way to make information exchange within and outside the government agency more efficient [14].

The process of opening up data, however, is perceived as cumbersome and many challenges remain [4]. One reason is that opening up data is often presented too simplistically [4], while, in reality, developing an open data strategy requires organizational transformation [5], with changes taking place on multiple levels. Research on public sector change and the implementation of information systems in (government) organizations often looks at drivers and enablers to identify those aspects that need to be in place to realize this change [18,19]. Furthermore, also the identification of barriers is found important to deal with them in undertaking transformational efforts [20]. Drivers, enablers and barriers are – while not the same – related to each other and, therefore, we categorize these factors into four groups used in research or organizational change: information technology, organizational and managerial, legal and regulatory, and institutional and environmental [21]. For every category we reviewed literature to identify the factors that influence the process of opening up data. An overview of these factors is shown in table 1.

Table 1. Overview of organizational drivers, enablers and barriers to open data

	Drivers	Enablers	Barriers
Information technology	Linked data [4,12,13]	Usefulness of the databases [4,10]	Poor data structures [4,22]; Legacy systems [4,22]; Fragmented databases [4,22]; Limited data quality [4,6]; Lack of standardization [4,6]
Organizational and managerial	Efficiency and budget cuts [4,6,14]	Data stewardship [4,10]	Complexity of the changes to be made [4,5]
Legal and regulatory	PSI directive [9]; Law enforcement [6]		Privacy and data protection [4,6]; classified information [4,6]
Institutional and environmental	Transparency and accountability [2,4,14]; Enabling re-use [3,4,11,17]	Political leadership [6]; Value for users [4,11]	Closed culture of government [6]; Lack of support of user feedback [4]

The *drivers* of the process of opening up data are linking data on the information technology layer, efficiency on the organizational layer, compliance on the legal and regulatory layer, and transparency, accountability, and enabling re-use and innovation on the institutional and environmental layer. The *enablers* found in literature are the usefulness of databases, including easier access to data on the information technology layer, data stewardship and management on the organizational and managerial layer, and political leadership and value for users (including economic as well as societal value) on the institutional and environmental layer. The *barriers* on the information technology layer are poor data structures, legacy systems, fragmented databases, limited data quality, and lack of standardization. On the organizational and managerial layer the barrier found is the complexity of the changes to be made. On the legal and regulatory layer we identified privacy, data protection, and classified

information as barriers, and on the institutional and environmental layer the closed culture of government and the lack of support of user feedback were found. We will use the case study to validate and elaborate these drivers, enablers and barriers.

3 Case Study Methodology

In the previous section, we used literature to identify drivers, enablers and barriers to opening data in an organization. The second step of this research is to identify the factors influencing the process of opening up data in practice to validate, refine and/or elaborate the findings from literature. For investigating the process of opening data we use an interpretivist methodology for in-depth research, which fits the complexity of the matter [23]. Using a longitudinal case study approach we aim to identify the drivers, enablers and barriers to opening data. The case selected is TNO, an RTO based in the Netherlands. As this semi-public organization is in the middle of opening up its data to the public, we were able to collect data throughout the process.

For the data collection we used a triangulation of methods [24]: action research, surveys and interviews with relevant stakeholders. Firstly, we were involved in the process of opening up data, supporting the relevant stakeholders during the process. Secondly, a survey was sent out twice to different stakeholders of open data within the organization (such as data owners, senior management, information officers, strategists and lawyers). These surveys aimed to capture the attitude of stakeholders with regard to the importance of open data for the RTO to identify the drivers, enablers and barriers within the organization. These surveys were sent out at different moments in time: the first survey was sent before the process of opening data commenced in September 2012 and the second survey was sent out in November 2012 after the first data sets had been opened up.

Three main questions were asked in the survey. The first question concerned the reasons (*drivers*) for opening up data and for implementing an open data strategy. The second question concerned the *enablers* of opening up the data. And the third question concerned the *barriers* and impediments to opening data. Options for answering the questions were provided and the respondents were asked to indicate the importance of the different options on a five-point scale ranging from very important to very unimportant. The second survey was an evolution of the first. While the main questions remained the same, some answers were added based on new insights. The response rate for both surveys approximated 50% (14 and 15 responses out of approximately 30 invitations, respectively). The second survey showed that most respondents considered themselves data owners, collectors, analysts or having a commercial role. Technology developers, legal and communication professionals were relatively underrepresented.

To validate the survey findings, we conducted nine semi-structured interviews with different types of stakeholders. These interviews were undertaken in November 2012 and in January 2013 and lasted around 45 minutes. These interviews were held with a five data owners, a director or research, a strategist and an information manager to reflect on the process of opening up their data. Central questions concerned the strategic choices for opening up data of the RTO, and their experiences with opening data, such as the main driving, enabling and impeding factors.

4 Case Study: RTO

The RTO has a history in opening up data. The organization has long opened some of its research data to the public; for some time, the organization even was the largest contributor of datasets to the national open data portal data.overheid.nl. However, opening up data never took place in a structured manner; occasionally, datasets were opened. Therefore, during the fall of 2012 and beginning of 2013 the RTO undertook a pilot project to investigate the process of opening up data with the purpose of learning from this process. In this pilot project three datasets from different domains (transportation, working conditions, and geology) were opened up. The datasets took part in a *hackathon*, a workshop in which programmers can re-use the data to develop their own services. The first survey was sent to the relevant stakeholders during the preparation of the databases for the hackathon, and the second survey was sent during the publication phase. Afterwards, we evaluated the process during the interviews.

4.1 Open Data Strategies

The RTO is a semi-public organization and, as such, the organization is accountable to the Freedom of Information act. Furthermore, the central government has demanded the RTO to open up all research results and data that are not harmful to the privacy of individuals nor to the security of society. In addition, the RTO aims to adopt a strategy of enabling others to use data that are gathered using public funds. At the same time, as the organization competes on the European as well on the national market for research projects on a daily basis, the RTO aims to develop a business model using its data to attract new research projects. It aims to do so either by creating new business models for existing datasets, or by helping other organizations to develop an open data strategy. The organization is thus in need of an open data strategy that supports these different objectives.

In the surveys and the interviews, we asked questions about the relevance for the RTO of having an open data strategy in place. In the surveys, the respondents were asked what they consider to be the importance of a number of drivers for opening up data, based on a five-point scale ranging from very important to very unimportant. Based on the answers in the first survey, the second survey was somewhat altered. The main difference between the two surveys is that we added drivers that are related to the commercial proposition of open data. The drivers that were included in the surveys and in the interviews, as well as their results, can be found in table 2.

Table 2. Drivers of open data in the RTO

Open data drivers	Preparation phase survey	Publication phase survey	Evaluation phase interviews
Open data should be part of the mission of the RTO	11 out of 14 respondents consider this important	10 out of 15 respondents consider this important	All interviewees consider this the most important reason for opening data

Table 2. (*Continued.*)

Using open data as a sales instrument and developing business models for open data	Not included in the survey	Considered important by 9 and 7 of the 15 respondents respectively	Interviewees indicate its importance, but find it difficult to develop business models
Re-use of open data by third parties	8 out of 14 respondents found this strategy important	Found important by 7 of the 15 respondents	Considered important, but also a threat, as others can freely re-use data collected by the RTO
Facilitating data sharing within the organization	7 out of 14 respondents indicated its importance	Only 5 out of the 15 respondents considered this important	
Gaining insight into how the organization works	Only 5 out of 14 respondents found this important	Was left out of the second survey	

4.2 Enablers of Open Data

In both surveys and in the interviews, we asked questions on the enablers the RTO envisaged for opening up the data. Hence, we asked the respondents and interviewees to indicate which enablers would be most important in each phase. Using a five-point scale (ranging from very important to very unimportant) we asked the respondents to indicate how they value the enablers. Based on the insights gained from the first survey, the second survey was changed somewhat. The main differences between the surveys are the addition of business-related indicators, and the introduction of risks such as privacy violation and reputation damage. The results from the surveys and the interviews can be found in table 3.

Table 3. Enablers of open data in the RTO

Open data enablers	**Preparation phase survey**	**Publication phase survey**	**Evaluation phase interviews**
Strategy development; clear vision of where to go with open data	9 out of 14 respondents consider this important	12 out of 15 respondents consider this important	Top-down and bottom-up developments are important
Solid timeline for introduction	7 out of 14 respondents consider this important	Not included in survey	Not mentioned as important by the interviewees
Management commitment	9 out of 14 respondents consider this important	Not included in survey	The interviewees emphasized the need for multiple forms of commitment, not just by the management

Table 3. (*Continued.*)

Dividing roles and responsibilities; keeping track of data	10 out of 14 respondents consider this important	10 out of 15 respondents consider this important	This was considered very important in order not to risk damage to the reputation of the organization
Partnerships with third parties	9 out of 14 respondents consider this important	13 out 15 respondents consider this important	Considered difficult, many questions arose on how to connect with potential re-users of the data
Business models	Not included in survey	10 out of 15 respondents consider this important	Interviewees indicated that they find it hard to come up with good business models for open data
Embedding open data in organizational processes	Not included in survey	8 out of 15 respondents consider this important	Considered very important, both top-down and bottom-up
Standardization and data quality	8 out of 14 respondents consider this important	13 out of 15 respondents consider this important	
Metadata	Not included in survey	9 out of 15 respondents consider this important	
Opening anonymized data only	Not included in survey	All respondents consider this important	
Creating a data portal	Not included in survey	14 out 15 respondents consider this important	Considered important
Pilot projects	10 out of 14 respondents consider this important	Not included in survey	The pilot that was undertaken was considered very useful to gain understanding in how to open up data

4.3 Barriers to Opening Data

Questions on the barriers to opening data were asked in both surveys and during the interviews. Hence, we asked the respondents and interviewees to indicate which barriers are most important in each phase. Using a five-point scale (ranging from very important to very unimportant) we asked the respondents to indicate how they value the barriers. We changed the second survey based on the findings from the first survey. The main changes were the exclusion of security risks and the inclusion of business-related barriers. The results can be found in table 4.

Table 4. Enablers of open data in the RTO

Barriers to opening data	Preparation phase survey	Publication phase survey	Evaluation phase interviews
Security risks	9 out of 14 respondents consider this important	Not included in survey	Due to a lack of experience with open data, the interviewees are uncertain about the optimal degree of openness, taking into account privacy and security
Privacy risks	6 out of 14 respondents consider this important	11 out 15 respondents consider this important	
Lack of interest by third parties	3 out of 14 respondents consider this important	7 out 15 respondents consider this important	Respondents at the RTO stated that problems in the communication between the data-owner and potential re-users was an important challenge
Lack of a business case for open data	Not included in survey	9 out 15 respondents consider this important	
Reputation damage to the organization as a result of low data quality	10 out of 14 respondents consider this important	9 out 15 respondents consider this important	
Reputation damage to the organization as a result of re-use of data	8 out of 14 respondents consider this important	11 out 15 respondents consider this important	
Embedding open data in the organizational strategies	5 out of 14 respondents consider this important	6 out 15 respondents consider this important	Respondents indicated that translating open data into the existing organizational strategies, e.g. on innovation, and processes is an important barrier too

5 Findings and Discussion

In all three investigations, being a semi-public organization was seen as the main driver for having an open data strategy in place. In other words: open data was considered mostly from the viewpoint of transparency and accountability in the RTO. The second most important driving force for opening up data was the business value it could generate for the organization, either by developing business models for open data, or by using open data as a sales instrument. However, as the director of research stated, there may be a tension between the transparency and the commercial objective of the organization: “Our role in the world of open data is quite interesting. We want transparency, we want to stimulate re-use of our data and at the same time, we have to

make money. In a way, this makes open data even more challenging for us than for public organisations". The third driver that was found important was enabling re-use by third parties. The strategist: "The public deserves an optimal return on investment in data we collect with public funding. We collected the data with a certain objective, but it can be useful for many other objectives we cannot even think of". This shows, firstly, that semi-public organizations often need to balance more strategies regarding open data than government organizations. Further research on the drivers of open data may focus on open data business models and how these models balance commercial and social goals [25, 26, 27].

The first survey shows the importance for organizational enablers, such as undertaking pilot projects, developing a strategy for open data, management commitment, and clearly dividing roles and responsibilities in order to control the access to the data as well as the data quality. These were not mentioned in the literature and are thus added to the refined overview of drivers, enablers and barriers in table 5. In the second survey, factors related to the re-use of data were found especially important, such as privacy, standardization and publishing metadata, as well as connecting with re-users of data through setting up a data portal and partnerships with third parties. Especially factors related to building partnerships with end were not found in literature and therefore added to table 5. It thus appears that throughout the process of opening data, attention shifted from organizational issues to issues related to re-use. The interviewees corroborate this shift in their discussion on how to ensure the re-use of data. They found that randomly uploading data does not automatically lead to re-use. Instead, they consider the development of open data communities useful for stimulating re-use of data. The second finding is thus that throughout the process of open data, focus shifts from the internal organization to external users of data.

Also the importance attached to the barriers shifted between the first and the second survey. In the preparation phase barriers that were found most important were low data quality and the security risks of opening up data, for example the risk of data leaks, while the lack of interest from third parties, such as open data re-users was considered the least important challenge. After publication, security risks were replaced by privacy risks (and related reputation damage) as an important barrier to opening data. The runner-up barrier was the uncertainty of how open data would generate future revenue (added to table 5, as it was not found in literature). The interviewees still had doubts about how to balance privacy and security risks with the requirements of opening up data by the central government. A data owner: "It was difficult to decide which data to open, and on what level, because we also have to comply with the data protection act". The third finding is thus that throughout the process the more technically oriented barriers became less important as they were addressed, while factors regarding the impact of open data during re-use became more important. Still, the interviewees also maintained that a major challenge was to mobilize organizational support for an organization-wide open data strategy, and embed the open data strategy in the current data management processes (added to table 5). The director of research: "We need top-down as well as bottom-up support for open data".

Table 5. Refined overview of organizational drivers, enablers and barriers to open data

	Drivers	Enablers	Barriers
Information technology	Linked data [4,12,13]	Usefulness of the databases [4,10]; ***Findability of the data (technically as well as through advertisements)***	Poor data structures [4,22]; Legacy systems [4,22]; Fragmented databases [4,22]; Limited data quality [4,6]; Lack of standardization [4,6]
Organizational and managerial	Efficiency and budget cuts [4,6,14]	Data stewardship [4,10]; ***Clear implementation strategy***	Complexity of the changes to be made [4,5]; ***Lack of business case for generating revenue from re-use; embedding open data in the strategy and work processes***
Legal and regulatory	PSI directive [9]; Law enforcement [6]		Privacy and data protection [4,6]; national security [4,6]
Institutional and environmental	Transparency and accountability [2,4,14]; Enabling re-use [3,4,11,17]	Political leadership [6]; Value for users [4,11]	Closed culture of government [6]; Lack of support of user feedback [4]

By looking at the process of opening up data in a semi-public organization, we found that during the process attention shifted from organizational concerns such as ensuring publication to concerns regarding re-use of the data and forging partnerships to with end users. While many government organizations regard opening up their data mainly as a technical process, this study finds that organizational aspects, both within the organization and with third parties re-using the data are found more important for realizing open data. The case study demonstrates that open data is an opening move for a more fundamental strategic process, in which multiple barriers (such as ensuring security, privacy and re-use) need to be dealt with. Based on this case study of the RTO we thus find that open data needs to be properly embedded both in the business proposition of organizations, as well as in the technology. This study thus corroborates findings that open data requires transformational changes to the organization of (semi-)public agencies [5].

The survey results also reflect the tension that is felt between the different drivers of open data: between those that reflect the public function of the organization and the commercial function of the organization. At different times, different enablers and barriers become more or less important. This may be an indication that this paradox is false: openness as a strategy can shift the commercial value of these data to intelligent services based on the data, but perhaps not simultaneously. Semi-public organizations require open, networked forms of innovation that, for example, change the way they interact within a networks of stakeholders [5]. Further research may look into how these different objectives can be achieved. One way of investigating this matter is by

applying recent insights on institutional complexity and how organizations deal with competing logics triggered by information technologies [28,29], to better understand the organizational difficulties of opening up data.

6 Conclusion

This paper investigated the process of opening up data in a semi-public organization. Semi-public organizations differ in their objectives for opening up their data from public organizations. While government organizations mainly pursue open data because they aim to be transparent and accountable as well as enabling re-use of their data for economic purposes, semi-public organizations also aim to use open data to enhance their own strategic position and become more efficient and generate new income. Based on the case study of an RTO in the Netherlands, we found that while the drivers for open data remain the same throughout the process, the enablers and barriers shift. While internally focused, organizational factors were the main focus at the beginning of the process, attention shifted gradually to externally oriented factors, such as stimulating re-use and forging strategic partnerships with end users. Furthermore, we found that especially semi-public organizations have to deal with a variety of drivers for open data, based on their public and commercial goals, that they need to balance. Further research should thus focus on how to develop well-balanced open data business models, foster re-use and build strategic partnerships with end users around datasets as well. Furthermore, scholars can focus on how organizations can deal with these competing logics and with how organizations could align open data with their general strategy as well as their information technology.

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Open Government Portals Assessment: A Transparency for Accountability Perspective

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Abstract. Dataset portals such as Data.gov and Data.uk.gov have become flagship initiatives of open government and open data strategies. These portals aim to fulfill the open government objectives of promoting re-use of public sector information to develop new products and services, and increasing transparency for public officials' accountability. This work focus on the latter and its aim is to propose a set of requirements as part of a framework to assess whether dataset portals are indeed contributing to a higher degree of transparency focusing on accountability. Previous studies on internet-based transparency (including Internet Financial Reporting – IFR) were analyzed, from which several requirements were derived concerning the data types sought after, the public entities covered, the information seeking strategies adopted and the desired qualitative characteristics of data. The rationale behind our proposal is that dataset portals developed under the open government principles should, at least, be able to fulfill the informational and operational requirements identified in the 'traditional' transparency assessment literature.

Keywords: Dataset portals, transparency, accountability, assessment.

1 Introduction

The idea of open government is not new: Linders and Wilson [22] trace the origins of open government back to the Swedish Freedom of the Press Act in 1766. But perhaps the most notorious and visible recent effort to promote the principles of open government can be attributed to the Open Government Directive (OGD) [25], issued by the Obama Administration in 2009. Open government strategies such as the OGD include as one objective the promotion of governmental transparency which involves the "publication of government data intended to support accountability and reuse for social or economic value" [22]. In this work we are particularly interested in transparency for public accountability, that is, the disclosure of data which provides citizens and other public stakeholders "with the information needed for judging the propriety and effectiveness of the conduct of the government" [3].

Dataset portals (described as "services supporting the location of public sector information (PSI)" [33]) such as Data.gov and Data.gov.uk quickly became flagship initiatives of open government, but they are not isolated initiatives. Data.gov, for

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 62–74, 2013.

instance, provides an extensive list of other open data sites, as part of open government initiatives, including 39 concerning US states, 39 related to US cities and counties, 40 maintained by other countries and 140 from international regions[1]. Huijboom and Broek [19] have also identified and analyzed open data strategies from five different countries (Australia, Denmark, Spain, the United Kingdom and the United States) which include the financing of open data portals.

Despite this widespread movement towards the promotion of governmental open data (dataset) portals, two questions arise: Are these portals effectively making data available for accountability (transparency) purposes? How can that be assessed? The aim of this paper is to identify and propose a set of requirements as part of an assessment framework that may be used to answer these questions.

The lack of evaluation guidelines regarding the implementation of open government principles was emphasized by Darbishire [10] who recognized that "limited examples of monitoring of proactive disclosure by official or oversight bodies" were found and recommended that monitoring of proactive disclosure initiatives should be put in place [10]. Even the OGD did not provide an assessment framework on how to evaluate US agencies plans and, more importantly, on how to evaluate their implementation and results [2]. More recently, Huijboom and Broek [19] noted that, from the five countries analyzed in their work, only the UK and the US have evaluated their open data policies but none of them have assessed their economic and social impacts. Harrison et al. [17] also acknowledge the lack of frameworks and procedures to assess open government.

Regarding the actual data being disclosed, McDermott [23] recognized that, in what concerns Data.gov, "no one has done an overall assessment of the data sets". According to Harrison et al. [17], even if the data disclosed is "both usable and of high quality", simply making data available does not necessarily mean that government is being more transparent and accountability of public agents is facilitated. As a consequence, these authors developed and proposed a "public value assessment tool" intended to guide assessment exercises and record the analysis product. In a similar effort, Reggi and Ricci [29] analyzed 434 EU Cohesion policy and Structural Funds related datasets, and classified them into three clusters according to their characteristics concerning the policy principles of "stewardship" and "usefulness" [11].

Another strand of assessment research dedicated to technical aspects of data disclosure, that is, the way data is being disclosed within dataset portals. Such research is usually focused on the respect for principles of Open Government Data [24] and Linked Open Government Data [33]. In this sense, Kalampokis et al. [20] recognize two broad technological approaches to classify Open Government Data and distinguish between "downloadable files" and "linked data".

Despite all research efforts described, no dataset portals assessment framework were found, specifically in what concerns the ability of those portals to promote transparency and allow for accountability of public agents. The goal of this paper is therefore to provide such a framework in the form of requirements derived from the analysis of transparency research literature. Even before the emergence of open

[1] `http://www.data.gov/opendatasites` (last visited on 3/3/2013).

government related dataset portals, such literature used assessment models and procedures that relied on individual web site analysis to evaluate the transparency degree of public entities. The assessment models used, and their underlying informational and procedural requirements, should apply to the new context of 'dataset portals' by defining a minimum set of requirements dataset portals must fulfill to respond to the needs of citizens and other stakeholders when conducting accountability processes. Therefore, these requirements form the basis of our assessment framework proposal.

The remainder of this paper is structured in the following way. Section 2 briefly describes the transparency assessment literature considered. Section 3 analyses those papers according to 4 relevant dimensions which will be considered in section 4 to propose a set of requirements that compose the assessment framework. Some final remarks are presented in section 5 (conclusions).

2 Transparency Assessment Literature

The proposed framework assumes that dataset portals, in order to promote government transparency and accountability, should (at least) fulfill the requirements identified in the transparency assessment literature. Table 1 presents the list of research papers considered (the more recent works are presented in the end), the majority of which address internet-based transparency, with one exception [7] (which considers paper-based disclosure). The list does not result from a formal literature review process, but rather from an ongoing research effort.

3 Analysis

To analyze these papers two important dimensions were considered: the type of public *entities* studied and the *information types* sought-after. The sequence by which these studies define those two dimensions characterize different information seeking scenarios. Once these two dimensions are established, studies also consider in their assessment technical and qualitative aspects of the data being disclosed. Only the latter will be considered in our analysis.

3.1 Entities Covered

Several types of entities were addressed by these studies, including different types of local, regional and central authorities, and universities. Clearly, local governments are the most chosen research target. Some studies address a single type of entities while others consider several (although similar) entity types. In some cases the authors perform international comparisons, although most research concentrates on entities from a single country. The number of entities considered in each study varies. Some studies consider all entities of a particular type (for entity type characterization purposes), while others select a sample of entities of a particular type based on some characteristic criteria (e.g. [8]) or using a random selection process (e.g. [35]).

Table 1. Transparency assessment literature

Research paper	*Entities*	*Information type*
Coy and Dixon [7]	New Zealand universities	Annual reports
Groff and Pitman [15]	100 Largest U.S. municipalities	Financial reporting (budgets, CAFRs, popular reporting)
Caba Pérez et al. [4]	Central administrations of the E.U. countries	Budgetary and financial information; Management indicators
Laswad et al. [21]	30 Local authorities in New Zealand (regional, city, district councils)	Financial highlights; Annual reports; Annual plans
Rodríguez Bolívar et al. [30]	Anglo-Saxon, South American and Continental European central governments (Departments of Finance)	Budgetary and financial information; Management indicators (performance)
Rodríguez Bolívar et al. [31]	Spanish regional governments	Economic and financial information; Budgetary information; Performance indicators
Pina et al. [26]	319 EU regional and local governments (76 cities and 242 regions or counties of the first 15 EU countries)	Transparency (Ownership, Contacts, Organizational or operational information, Issues, Citizen consequences, Security and Privacy)
Styles and Tennyson [36]	300 U.S. Municipalities	Comprehensive Annual Financial Reports
Caba Pérez et al. [5]	Spanish municipalities	Budgetary information and cash-flow; Financial position; Non-financial information (Indicators related to public service management: efficiency, effectiveness, and economy)
De Kruijf [12]	Municipalities above 40,000 inhabitants in North Rhine Westphalia and the Netherlands	Full budget documents; Annual reports
Gandia and Archidona [13]	Spanish municipalities above 50,000 inhabitants	General information; Budgetary information; Financial Information

Research paper	*Entities*	*Information type*
Serrano-Cinca et al. [32]	Spanish provincial capitals and all town halls with over 70,000 inhabitants	Financial information (budget or annual accounts)
Pina et al. [27, 28]	75 European local governments (the 4 biggest cities plus the capitals of the first 15 E.U. countries)	Economic and financial information; Performance, social and environmental information; Transparency (organization chart, mission statement/activities, …)
Cárcaba García and García-García [6]	334 Spanish municipalities above 20,000 inhabitants	Informative content I (Budget, Balance sheet, Income statement, …); Informative content II (Explanations, Benchmarking references, …)
Yu [37]	Local government in China (all 63 provinces and cities excluding Hong Kong, Macao and Taiwan)	Idem [36]
Guillamón et al. [16]	100 Largest Spanish municipalities	Items from the Financial Transparency Index created by Transparency International Spain
Reggi and Ricci [29]	Regional operational programmes and regional managing authorities from EU member states	Data concerning projects and beneficiaries of the European Regional Development Fund (ERDF) and the European Social Fund (ESF)
Armstrong [1]	Florida's 67 counties and the 67 corresponding school districts	12 Public records in accordance to Florida State Statutes, including government contracts, budgets or financial information, and meeting agendas.
Grimmelikhuijsen and Welch [14]	80 Dutch municipalities	Air quality data concerning the transparency of decision making, policy information and policy outcome
Sol [34]	Spanish municipalities	Idem [16]
Stewart et al. [35]	36 Australian State Government Departments (randomly selected)	Governance information (Annual Report, Organisational and Governance Structures, Strategy, Planning and Capability Building, Accountability, Audit and Risk Management)
Cucciniello et al. [8]	Pilot (purposive) sample of 113 Italian cities (Italian provincial capitals)	Information concerning four dimensions (institutional, political, financial, and service delivery), each of which concerning three stages (static, dynamic, feedback).

3.2 Information Types Covered

Noticeably, the most sought-after data is related to financial, budgetary and management information (including performance indicators). More detailed data concerning public spending (still with a financial impact), such as government contracts [1] and public funds management programs [29], is also considered.

Cucciniello et al. [8] add to this financial dimension three other types of information associated with a *political*, *service delivery* and *institutional* dimension. The latter is based on the required items suggested in the Web Site Attribute Evaluation System (WAES). This was developed by the Cyberspace Policy Research Group ([9] apud [27]) and was originally used for evaluating US federal websites [27]. This *institutional* dimension is adapted and used on several works ([8, 26-28]) and it refers to items such as ownership (of web site), contacts, or activities (static information [8]). Governance information (such as strategy, planning and capability building) is also considered in the studies [35]. Finally, Grimmelikhuijsen and Welch [14] used the *process* and *event* transparency concepts proposed by Heald [18] and search for data concerning decision-making processes, policy content, and policy outcomes.

From the different main types of information identified in our survey it is possible to conclude that the nature and type of the information sought-after in transparency studies is not always 'compatible' with the dataset format: sometimes researchers look for mainly textual reports with little supporting (numerical) data. Also, some data is clearly produced in continuum (such as contract related data) while other is produced at a single point in time (such as budgets).

3.3 Information Seeking Strategies

In general, research papers address a particular type (universe) of entities and aim at assessing the degree of web-based transparency of all or part of entities belonging to that universe by seeking on their individual web sites for relevant information items (and the way they are disclosed). The work by Reggi and Ricci [19] is somehow distinctive in the sense that it begins by identifying the type of information sought after (European Regional Development Fund and the European Social Fund), and then identifies the entities that have the responsibility, at national level, to disclose it.

Although the common goal of these studies is to assess transparency, some aim to perform a descriptive analysis of the information disclosed (which entities do not report the expected items, etc) [29, 35], others aim to quantify the level of transparency and build a disclosure index (e.g. [31]), while still others identify factors (disclosure incentives) that account for the levels of measured transparency (e.g. [6]). Despite some differences, the authors usually adopt the following general procedure:

1. Select and define the type of entities to be assessed;
2. Identify a subset or the entire universe of entities of that particular type. In the former case, selection may be based on a specific characteristic (such the number of inhabitants of a municipality [13]) or entities may be randomly selected (e.g. [35]);
3. Determine and characterize the information item(s) expected to be disclosed by each of the entities considered;

4. Define other analysis dimensions of data availability, including desired qualitative characteristics, and technical characteristics of data disclosure and/or web site;
5. Define the global assessment model which considers all analysis dimensions, including determining weights for the different criteria and developing a scoring methodology (if applicable);
6. Visit each entity web site, and collect the data required by the assessment model to characterize or evaluate the entity.
7. Describe the results or compute the disclosure indexes according to that model.

As mentioned before, a slightly different information seeking scenario would start by identifying the required information types (step 3) and only then determine which types of entities should be assessed (steps 1 and 2): typically those responsible for the information considered. Dataset portals assessment frameworks must take into consideration these information seeking scenarios and other possible variations.

3.4 Qualitative Requirements of Data

The assessment exercises described in the literature usually consider in their models qualitative characteristics of the data available and technical characteristics of the web sites. The required qualitative characteristics of data are commonly selected based on international best practices (e.g. Caba Pérez et al. [4]) and most commonly include the requirements for completeness, timeliness, understandability or clarity, comparability, relevance and reliability [4, 30]. Some of these qualitative requirements are also considered as part of the eight principles of Open Government Data [24].

4 Assessment Framework Requirements

Based on the analysis presented in previous section, it is now possible to propose a set of requirements that form an open government dataset portals assessment framework. These requirements will be associated with each of the three main topics addressed in the previous section (entities covered, information types, and information seeking strategies). Whenever relevant, references will be made to desired qualitative characteristics of data although strictly technical aspects of data provision, such as data formats or linked data principles will not be considered.

4.1 Entities Covered

According to the literature analyzed, dataset portals, in order to fulfill transparency informational needs, should address the whole range of entity types possible in each country institutional arrangement. Portals curated by international organizations, might even be expected to cover entities from different countries. In this respect, users should be able to assess the completeness of the data provided.

R1: Portals should present a master list of all entity types covered (regardless of the entities that actually have provided datasets).

This means that dataset portals should cover the entire set of entities of a particular type. Again, in this context, users should be able to assess the *completeness* of the data provided. Some portals do indeed present a list on entities which have actually disclose datasets, but that information is not sufficient to identify which entities should provide the same information but are not doing so.

R2: Portals should present a master list of entities belonging to each one of the types covered (regardless of the entities that actually have provided datasets).

Search mechanisms alone do not meet the requirements identified in the transparency literature. A browsing mechanism, based on the master list of entities, offers a more reliable way to determine which entities, from each type, do not provide data.

R3: Portals should present a list of disclosed datasets associated with each entity.

4.2 Information Types Covered

To fulfill transparency informational needs recognized in the literature, portals should provide all datasets related to, at least, the whole range of information types identified in the previous section. These datasets should be clearly identified and associated with a specific type of transparency item. It should also be possible to easily determine which information items are not being covered by the datasets or are not being provided by a certain entity (for instance).

R4: Portals should provide a master list of accountability-oriented information items, and related datasets, which should be available (regardless of the actual provided datasets).

Some portals allow users to characterize their datasets using tags such as "transparency" or "accountability" (e.g., Data.gov) which are not consistently used and do not provide a complete view of all transparency/accountability related information provided. This master list should clearly distinguish the different types of transparency datasets (accountability or re-use).

R5: Portals should associate each dataset disclosed with each information type defined.

The literature also showed the importance to access institutional (entity characterization) information needed to allow for characteristic-based selection of entities.

R6: Portals should provide, for each entity, a minimum of institutional (characterization) information regardless of the other datasets provided by the entity.

Transparency literature also showed the importance of 'non-dataset compatible' information (such as textual reports) to accountability. In the context of a broader open government policy, portals should be adapted or complemented to cope with such type of information, despite the limitations of their current specific dataset nature.

R7: Portals should be able to accommodate 'non-dataset compatible' transparency-related information items (such as reports and other documents).

The literature also revealed the importance of clearly knowing the date and time associated with each dataset, and to follow the evolution of indicators (for instance). Sometimes, entities provide several datasets concerning the same information item but related with different time periods (years, for instance).

R8: Portals should explicitly indicate, for each information type, which update periodicity is expected for individual datasets.

Also, without and explicit dataset time organization structure, it becomes very difficult to identify missing datasets from a particular entity at a given time, and to perform longitudinal analysis concerning a particular entity or information item.

R9: Portals should explicitly associate each dataset with a specific time/period tag.

Whenever possible and relevant, entities should provide the data as it is created and not only on a periodic (yearly) base, thus allowing for *real-time transparency* [18]. The *timeliness* of the data is one important qualitative characteristic valued in the literature.

R10: Portals should be prepared to allow datasets to be updated in real-time, thus reflecting the circumstances at each moment.

The assessment exercises reported in the literature rely on the *comparability* of data provided by different entities. This implies that for each information type, a common set of characterizing elements must exist to allow for such comparability.

R11: Portals should define the minimum set elements that must be disclosed by each entity type, for each information type.

This set of characterizing elements should also take into consideration the principles of *completeness* and *relevance*, two qualitative characteristics of data identified in the literature.

4.3 Information Seeking Strategies

Different possible information seeking strategies were identified from the literature. Portals, as key components of open government initiatives, should support citizens to pursue accountability regardless of the way information is sought-after.

R12: Portals should adopt and make visible an overall organization structure, according to the requirements previously presented, and provide related browsing and selection tools.

This organization structure and corresponding tools should facilitate the identification of non-reporting entities, missing datasets by some entities and longitudinal studies (for instance).

5 Conclusions

There is a significant body of scientific literature dedicated to the assessment of web-based public entities transparency. Most of this literature considers the data provided in each entity individual web site as a proxy for its transparency. But the emergence of dataset portals, in the context of open government programmes, has an impact on the way transparency is 'traditionally' assessed: from now on it is necessary to consider that at least part of the data expected to be disclosed in an entity web site might be available through 'collective' dataset portals. This means that the procedures adopted by this assessment literature might no longer be totally adequate.

Also, dataset portals were created to meet the objectives of open government strategies, including promoting transparency and therefore facilitating the accountability of public agents. However, no evidence was found in the open government literature that the way data is provided by these portals, and the data itself, might in fact contribute to meet such objective. Research has been mainly focusing on open government strategies formulation, implementation and impact assessment, and technical aspects of data availability. One matter seems clear: disclosing huge amounts of datasets does not necessarily equate to more transparency and does not necessarily facilitate accountability.

Despite the shortcomings of the assessment methodologies identified in the literature to deal with the new portal reality, they may still be considered as proxies for the way information is sought-after in the context of accountability processes. Therefore, this work analyzed the 'traditional' transparency assessment literature and identified a set of requirements that dataset portals need to fulfill in order to contribute to the transparency of public entities and allow for the accountability of public officials. Such requirements concern the type of entities covered by dataset portals, the type of information types provided, the information seeking strategies supported and some qualitative aspects regarding the data provided.

Further research is needed to complement the proposed set of requirements by considering, for instance, qualitative aspects of data delivery and the informational needs of 'real' citizens in what concerns public accountability. The next step is to fully develop an assessment model and procedure based on the requirements identified which could be used to evaluate dataset portals and other elements of open government strategies. The ultimate goal is to give governments the information they need to improve their open government strategies and therefore contribute to increase transparency and allow for better accountability.

Acknowledgements. This work was partially supported by Fundação para a Ciência e a Tecnologia (FCT) under project grant PEst-C/EEI/UI0308/2011.

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A Guide to Implement Open Data in Public Agencies

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Abstract. This article presents a guide to implement open data in Public Agencies (PAs). The guide is the result of a worldwide proposal's study, of the application of a maturity model to diagnose the situation of PAs in Latin American countries, the opinion of experts in different excellence centers, e-government authorities, and developers of open data application in the world. The guide is simple and orients decision makers so that PAs following the actions of the guide can see their capacities improved when facing a diagnosis of their institutional maturity in implementation of open data.

Keywords: open data, open government data, roadmap, maturity model.

1 Introduction

The need to encourage data reuse is a key task, since it allows promoting the capacity of innovation of developers and infomediaries. According to de la Fuente (2012), impulse of policies and availability of mature technology standards as the semantic web, are enabling a great revolution in the way of distributing and consuming public information. Both, websites and data will link to one another, reducing dramatically the cost of reuse, simplifying their integration with future applications (Berners-Lee, 2009). CTIC Foundation (2011) suggests configuring a kind of ecosystem among government, companies and citizens to promote the re-use of Public Sector Information (PSI) and thus contribute to social welfare (Harrison, Pardo & Cook, 2012).

Yu & Robinson (2012) indicate that publish data, in a structured way, is only a necessary condition to dispose of new applications and services, in most cases it is not realistic to expect that innovation occurs automatically.

An action plan is required then, to stimulate the consumption of a dataset between infomediaries companies and developers; this promotes the creation of new applications, driving an economical area whose axles are on one side technical and on the other business. Promoting interoperability and transparency between Public Agencies (PAs) must be a key element of the plan (CTIC, 2011).

Other components to consider in a plan are: gathering information from citizens to know what is the most relevant information to them, incorporating social networks to common channels of participation, since Open Government Data projects (OGD)

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 75–86, 2013.

succeed where they satisfy the existent demand of information and commitment (Yu & Robinson, 2012). In short, there must be an active partnership between government and private stakeholders.

It is necessary to spread out the efforts made by PAs. The plan proposed by CTIC Foundation, incorporates access points (open data portals) and measurement and follow up of the action plan impact. This last point requires establishing a set of indicators that will facilitate measuring and plan targets compliance.

In this context, we give some recommendations to address this complex task, synthetizing in a roadmap the implantation of a sort of OGD ecosystem between government and concerned community (stakeholders). Then, based on this roadmap, the Open Data Implantation Guide (ODIG) provides 15 recommendations. If PAs follow ODIG recommendations, then they will have a maturity level equal to or above 3 from a maximum of 4 in the maturity model shown in Solar et al. (2012).

In Section 2 we show the state of the art in which we base the open data implementation guide shown in Section 3. Finally, we conclude in Section 4.

2 State of the Art

Three sources provided information for the development of recommendations tailored to reality. The first one related to the bibliography in OGD subject, from which different proposals of open data implementation arise. The second source, related to the results of the Open Data Maturity Model application, known as OD-MM, from which are collected the recommendations suggested by the model; and the last is a survey carried out by stakeholders and OGD experts around the world.

2.1 Experiences Reported in the Bibliography

In the Obama's emblematical memorandum, described in detail in McDermott (2010), the open government directive instructs PAs to include in their plans, linking to a website that has information about their Freedom of Information Act (FOIA) processing and processes. It includes a description of the staffing, organizational structure, agency's capacity to analyze, coordinate, and respond to such requests in a timely manner, and if the PA has a significant backlog, milestones that detail how the agency will reduce its pending backlog of outstanding FOIA requests by at least 10% each year.

The directive requires executive departments and PAs to take the following steps to the goal of creating a more open government: (1) Publish government information online; (2) Improve the quality of government information; and (3) Create and institutionalize a culture of open government.

Required components of the open government plans developed by PAs are: Transparency; Participation; Collaboration; Flagship initiative; and Public and agency involvement.

In May 2012 they released the digital strategy of the U.S. Federal Government in the document entitled: "Digital Government: Building a 21st Century Platform to

Better Serve the American People". This document establishes 4 strategic principles that will guide initiatives in digital government, as follows: Focus on information; Shared platform; Focus on the customer; and Security and privacy.

Another case is the government of Australia that provides 13 recommendations as a guide to Government 2.0, summarized in Gruen (2009).

Based on the selected Open Government Initiatives (OGI), relevant literature, and interviews with several PAs, Lee & Kwak (2011) identify ten key challenges for open government implementation in three dimensions: Organizational; Technology; and Government-wide challenges. Lee & Kwak (2011) present also 15 recommendations that PAs can use to effectively implementing their OGI.

As measures for a local government (municipal) in ORSI (2010) ten measures are proposed. In the same sense, but in a specific application scope in the U.S., the 8 steps guide in Kaufman & Wagner (2012), designed for transportation agencies: to open and maintain data, overcome potential obstacles, and create a relationship with users. The steps are: Find your data; Convert data; Test your output; Write up a license agreement; Publish and publicize; Update and modify as needed; and create and maintain a dialogue.

2.2 Recommendations Collected from OD-MM Maturity Model

OD-MM maturity model (Solar et al., 2012) applied to six PAs in three countries in Latin America (Chile, Colombia and El Salvador), provided a diagnosis to each PA. Each diagnosis generates its corresponding roadmap with recommendations to continue evolving to the next level of the maturity model. Recommendations to improve on lesser capacity level issues detected in the application of the OD-MM model implementation are typical of a more advanced stage of this new way of governing. It is necessary therefore, to move towards an integrated State, transparent and participatory that solves the problems of citizens and private institutions.

From the recommendations obtained directly from the roadmaps automatically generated by OD-MM model, the following are the suggestions most frequently generated in the implementation of the model:

1 Create training initiatives on issues related to OGD, as the use of IT tools, digital communication systems, office automation, e-services, etc. Create an OGD specific training plan identifying needs of training and other pertinent matters, where staff responsible of OGD training requires an appropriate training.
2 Manage projects with established procedures. Create a Project Management Office (Letavec & Bolles, 2010), to ensure the compliance of standard procedures in management of all OGD projects of the organization.
3 Establish metrics to assess OGI. Prepare a standard and compliance goals to measure results of programs and initiatives. Create a regular and systematic assessment plan to identify a set of appropriate metrics to evaluate OGI performance, as the compliance of external regulations, among others.
4 Publish numerous open data to the community, covering the entire organization.
5 Create full indicators, with internal tracking. Perform a light analysis of results and propose evident improvement measures.

6 Offer documents and materials, either of informative or strategic and technical character. Organize workshops with a more technical and/or business delineation.
7 Offer some self-financing opportunity or give adequate information about the possibility of external financing usable in the OGD project development.

2.3 Expert's Opinion

Consultations to stakeholders and OGD experts from 15 countries of four continents (America, Asia, Australia and Europe) gave a first-source perception about impacts, either social or economic, that open data have, its eventual reuse, and recommendations to fostering OGDs.

2.3.1 Survey Methodology

The methodology consisted primarily in building a poll that could be answered in few minutes, to have a higher rate of responses. Most of the questions were closed inquiries; the only requirement was to mark just the offered alternatives. Finally, the poll had 9 questions from which two were open answers and optional. Built in a Google doc format, this poll provided the chance of answering directly on the web.

The second step was the identification of a group of experts in OGD, for the poll delivery. Those contacted before were favored, since this increased the chances of a response within the time limits.

First three questions try to capture the importance of OGD for the expert, specifically on social and economic impact. Then, it is also important to know their opinion on issues such as the most relevant scopes, costs, benefits, risks and barriers for the OGD implementation. Finally, they responded an open question about their immediate experience regarding to specific results of some impact appreciated, either social, or economic, resultant of OGD and/or its subsequent reuse. An open question remained for further comments to help promoting OGI.

2.3.2 Survey Results

Each of the experts selected three areas they thought could create the greatest OGD impacts and its reuse. As shown in Table 1, the areas of "Transport" and "Transparency" are a third of the most named among 15 scopes shown, followed at a distance by the environmental issue.

According to the experts polled, most important benefits or advantages for society of the OGD and its reuse are "Transparency" with 25%, followed closely by increased citizen's "participation" (20%). It is interesting to emphasize they mentioned, with a significant frequency (14%), the benefits into PAs reflected in an increased effectiveness and efficiency of public policies. On the other hand, "updated information/knowledge" (rank 8 in Table 2) was an alternative not mentioned in the poll, but included by self-pollees. The economic benefits as "Economic development" and "Entrepreneurship", mentioned together with an 18%, is a significant figure and consistent with the importance level of the economic impact as per the same experts.

Table 1. Scope of OGD Higher Impacts

Rank	Scope	%
1	Transport	17%
2	Transparency	16%
3	Environment	9%
4	Culture and Recreation	7%
5	Public Administration	7%
6	Meteorology	6%
7	Tourism	5%
8	Delinquency	5%
9	Education	5%
10	Finances	5%
11	Health	4%
12	Business	4%
13	Properties and Land Registry	4%
14	Political scope	4%
15	Scientific	2%
	Total	**100%**

Table 2. OGD Benefits

Rank	Benefit	%
1	Transparency	25%
2	Participation	20%
3	Trust	17%
4	Efficiency and effectiveness of public policies	14%
5	Economic development	12%
6	Entrepreneurship	6%
7	Quality of life	3%
8	Updated information/knowledge	3%
	Total	**100%**

Table 3 presents main barriers or difficulties in initiating open data projects. As shown, the "Lack of political will" is the most frequently mentioned factor that avoids the implantation of OGI. Second, and with similar percentages (16% each), are the “cultural” factors, as well as the “lack of appropriate laws”, and “lack of leadership” (very similar to the “Lack of political will”).

Table 4 presents the responses associated to risks, limitations and costs related to OGD in general. It is remarkable that the issue "Sensitive data" appears as the main constraint or risk associated with OGI. Second, "Processing costs" of large volumes of data; and far behind in third place is the “investment” associated.

Some comments given by the experts are hereunder detailed:

- Difficulties in impacts measuring; there is a consensus about existent impacts, but for example, measuring the increase of trust in PAs does not seem easy. Other impacts associated with private benefits are measurable, but difficult to capture.
- In relation to the previous point, impacts in PA are also mentioned, by improving internal processes. This with respect to organization and classification of information, to make it more accessible. Additionally, fostering innovation in the country is not a minor issue.

- More training and divulgation: Several comments point out to the need of sensitizing authorities with seminars, divulgation and training campaigns for OGD issues.
- Finally, there are other comments emphasizing the urgency of these issues and the need to accelerate data opening processes, otherwise public pressure will become stronger increasing the discredit of government institutions.

Table 3. Barrier for OGD Implantation

Rank	Barriers	%
1	Lack of political will	20%
2	Cultural problems	16%
3	Lack of laws and regulations	16%
4	Lack of leadership	14%
5	Lack of qualified personnel	12%
6	Ignorance	12%
7	Lack of confidence	8%
8	Very high costs	0%
	Total	**100%**

Table 4. OGD Costs and Limitations

Costs	%
Sensible data	39%
Processing cost	21%
High investments	14%
None	11%
Publication of useless data / data quality is poor	7%
Data not reused	4%
Regulation	4%
Citizen's fear	0%
Total	**100%**

2.4 Comparing Proposals

When comparing the recommendations of the Australian Government (Gruen, 2009), with the U.S. government (McDermott, 2010), and ORSI (2010) for local governments as municipalities, private proposal of Lee & Kwak (2011), and an implementation proposal in a specific scope of application such as transport (Kaufman & Wagner, 2012), it is possible to find common factors to all of them.

First, in all proposals is mentioned, as an important action "A declaration of open government by the government", or else, they recommend "Develop and communicate a government-wide strategy", like the Open Government Directives (McDermott, 2010). In the same way, "coordinate with leadership, guidance and support" is similar to "align OGI with the agency's goals" or "institutionalize OGI" of Lee & Kwak (2011), and to "create and institutionalize a culture of OGD" in McDermott (2010).

The Australian recommendation: "Make PSI open, accessible and reusable" is not different to "Public data opening ", from ORSI, or "consider conducting pilot projects

and/or establishing centers for excellence" from Lee & Kwak (2011), or “flagship initiatives” in Obamas’ memorandum. Just as "Find your data; Convert data; and Test your output" is only the way to operationalize this.

The proposal "Encourage public servants to engage online" (Gruen, 2009), is not different from the proposals "using tools of internal collaborative work" and "encourage internal participation in the city council" in ORSI (2010), and is similar to "integrate public engagement applications" (Lee & Kwak, 2011).

Related to the "accessibility" issue, we have "create and maintain a dialogue" in Kaufman & Wagner (2012), "platforms of participation and citizen’s collaboration" in ORSI (2010), and "use a democratic, bottom-up approach" in Lee & Kwak (2011).

3 Open Data Implementation Guide (ODIG)

The following are some of the principles and criteria considered for the ODIG design:

- **Simplicity**: Time of implementation should not be too extensive, for example, if some laws are not required, initial results should be available within 18 months.
- **Quick-Win**: This principle means a quick initial development with some visible results that could help legitimizing the initiative and obtaining additional support from stakeholders. This involves the need of a subsequent long-term development, but experience acquired at the beginnings and its legitimization can facilitate the concretion of the following steps.
- **Maturity Level**: As a result of the above mentioned, this guide intends to provide the first steps towards the development of OGD in a PA. Still, if this ODIG can be properly implemented, it can be guaranteed that, submitted to the OD-MM maturity model (Solar et al., 2012), the entity could achieve a level 3 of maturity or very close to it (for a maximum of 4).
- **Share Experience**: Since development of OGD is a recent issue in the world (about four years), it is always worth to consider the learning and exchange of experiences between countries and institutions to move forward.
- **Data Liberation**: The data considered in ODIG are those contained and recorded in any format; they are collected, produced, and/or received by PAs, and should be available to the public in accordance with Harrison et al. (2012) recommendations.

ODIG is a consequence of the OD-MM application since it incorporates elements detected as weak in pilot PAs; as well as elements of both, bibliographic exploration and field research carried out throughout firsthand sources.

For the ODIG development and organization, the roadmap displayed in the following section, is a reference conceptualized with OD-MM maturity model domains. For this reason, the ODIG classified three groups, corresponding to the three OD-MM model domains: the first is the “Institutional and Legal Perspective” including eight recommendations concerning organizational and management issues. Second, the “Technological Perspective” with two recommendations, and finally the “Citizen’s and Business Perspective” incorporating 5 recommendations on issues related to data reuse, by the concerned community.

Nevertheless, and following the principle of simplicity already mentioned, ODIG develops the technological domain in a simplified way focusing only on fundamental issues addressed to decision makers, trying to avoid technicalities that could obstruct its comprehension. The reasons of this are: (1) Technology is by no means the main reason in OGD, since technology is just a means used to achieve it (Calderon & Lorenzo, 2010), and (2) Technology is in a constant change, it repeatedly surprises the experts themselves; therefore, the risk is high when offering detailed technology standards that in short term will be obsolete.

3.1 A Roadmap

Following are the general guidelines, called roadmap, oriented to the formulation of the ODIG. The order of this roadmap is only referential; it does not pretend to be exhaustive, not either is it necessary to complete all steps in a more developed level, and it can certainly perform some tasks in parallel:

1 Have an organization appropriate to build OGD that should not be necessarily equal to the existent, for the management of traditional e-government activities.
2 Hire and generate a training plan to provide qualified professionals in OGD.
3 Articulate an institutional statement provided by the Presidency in favor of an open government, as soon as possible, which should be part of the objectives definition and the strategy to follow on this topic (de la Fuente, 2012).
4 Have an interoperability platform between different PAs (desirable).
5 Datasets opening. Prior to this, carry out a market research regarding to the most relevant and priority data that companies and citizenship in general are requiring.
6 Develop an OGD policy including the adoption of standard open formats for data and metadata, to facilitate its later reuse.
7 Construction of an official website of OGD that includes the results of a previous study following the best international practices in the field.
8 Establish an action plan to stimulate data consumption between companies and especially among infomediaries.
9 Create alliances and agreements with stakeholders from civil society and private sector to promote specific projects of data reuse of a public value for citizens and/or PAs. Harrison et al. (2011) proposes alternatively that planning and assessing OGD being addressed within a “public value” framework.
10 Establish a measurement of initial diagnosis of PAs maturity level regarding to OGD, to serve as a baseline in the periodic measurement of progresses expected and approaches, and to facilitate necessary corrective and timely decision making.

This Decalogue is presented in generic or added terms; therefore, it represents the general framework and starting point for developing ODIG points for governments.

3.2 Fifteen Recommendations of ODIG

Considering a first source expert opinion, plus bibliographic research and elements development, in each of the two not technological perspectives of the open data maturity model, there is a sequence and prioritization of steps that the executor must consider when implementing ODIG. The estimated horizon of time considered ranges from 18 months and two years, depending on the starting point in each case:

1. THE EXISTENCE OF AN INSTITUTIONAL FRAMEWORK WITH A RECOGNIZED ORGANIZATION FOR OGD: This is the starting point to implement an OGI with some probability of success sustained over time. It might be ascribed to an existing e-government initiative or other related organization. This institutional framework must generate an organizational structure where formally defined positions and proficiencies cover the areas of management, planning and technical. For example, it is desirable to have a person in charge of PSI re-use (known as PSI manager), a contents manager who knows the procedures for data processing, with knowledge of databases and their applications, and web portals. Finally, a systems manager with competences in the equipment catalog and IT systems able to support storage and data publishing.

2. EXISTENCE OF A RECOGNIZED LEADER IN CHARGE OF IMPLEMENTING AN OGD INITIATIVE: It is necessary to appoint a suitable and sufficiently empowered person to hold a position that requires not only technical skills, but also a good political management to interact with different social levels of the public sector, and organizations of the civil world. This person should be responsible for developing a strategy, and drive the implementation process.

3. FORMULATION OF AN OGD STRATEGIC DEVELOPMENT PLAN: When formulating a plan, the recommendation is to involve different social actors and at diverse instances; namely, to generate seminars inviting diverse social organizations to make their contributions; in parallel, leave enough room on the website for the citizen feedback. Although the process seems slower, in the long-term will generate greater legitimacy. Additionally, it is worth to establish first bonds with civil society, actors of an OGI. Furthermore, the advice is to provide activities to the short, medium and long term plan. Short term measures, as far as possible, must be visible enough to generate a positive impact on the population and thus, more support for long term actions. This approach must incorporate a communication strategy.

4. CONSTRUCTION AND DELIVERY OF NECESSARY LAWS TO THE CONGRESS FOR A BETTER OPERATION OF THE OGD: This activity may vary from country to country and in some cases, omitted; however, in general it is necessary to promulgate laws related to the regulation of transparency in information and protection of sensitive information. OGD supervisor must seek legal advice to achieve the development of these laws, and promote a flexible remittance and promulgation of them. After this promulgation of laws, training and divulgation of them is the next step among interested stakeholders for a better understanding/interpretation of their scopes.

5. PROMULGATION OF POLICIES AND INTERNAL REGULATIONS: Not only standards are important (i.e., those related to information management procedures and their conversion to standard formats), but to keep evidence of their compliance through various control mechanisms. Additionally, the pertinent authority must ensure a proper understanding of the standards. An issue related to this point is the formulation of an open data policy including the adoption of open standards formats for data and metadata to facilitate their later reuse.

6. TRAINING PLAN IN OGD: Several studies inferred that it is essential to have support of trained personnel, which in general has not been formally resolved. Some institutions consider that an 'on the way' learning is enough, or that more advanced professionals in charge should be able to solve problems. Experience shows that this long-term strategy is inadequate and may increase the costs. The point again, is to follow the plan. This involves that after about six months, there will be available a significant number of key personnel trained in the techniques of OGD, digital communication systems, IT tools, e-services, etc.

7. PROJECT MANAGEMENT OFFICE DEVELOPMENT: The OGD implementation requires the development of several projects; therefore, it is necessary to ensure the compliance of standard procedures in management of OGD projects. This is a weakness detected in the field of software engineering; it tells of a high percentage of IT project failures, or at least backlogs in the compliance of delineated goals.

8. HAVE A PERFORMANCE ASSESSMENT SYSTEM OF THE PROJECTS: In general, it is possible that this system already exists in the PA. However, the results of documented experiences indicate that often no formal metrics mechanisms are present to measure projects performance, neither the establishment of specific goals.

9. DEVELOPMENT OF A STUDY OF REQUIRED ICT INFRASTRUCTURE CAPACITY: Decision makers must be aware of the need of safeguarding that systems will have sufficient capacity to manage the demands and requirements of citizens and infomediaries companies. (i.e., avoid equipment's saturation with web services).

10. GRADUALLY INCORPORATE SEMANTIC TECHNOLOGIES: These technologies are available today and it is a need to incorporate them, although their use is initially on an experimental basis, to train technical staff of the PA. With this, the PA can easily reach levels 4 and 5 stars of Berners-Lee (2009). The use of these technologies also allows to better manage a multiplicity of catalogs of different sources, from both, national and local governments; also from other State authorities, private sources, etc.; this, if the option is a distributed model of catalogs. In other words, facilitates interoperability, data aggregation, and catalogs, plus its updating from external sources.

11. DEVELOPMENT OF A FIRST OGI: This first initiative, recommended as a pilot, must be the most emblematic and with significant impact in the short term. Identification of the most relevant information and at the same time easier to open will be a tool for each country; however, it is important to consider citizens' participation in

the development of this initiative, in at least some of its stages. We suggest identifying those less sensitive data categories, but with a high impact when applying Quick-win criterion. This will avoid controversies and complexity that could delay the project.

12. EXISTENCE AND MANAGEMENT OF DATASETS INDICATORS FOR ACCESS AND/OR DOWNLOADING, TOGETHER WITH DATA MONITORING: Monitoring of access and data downloading is essential to assess the level of success, especially of the first initiative. This allows taking appropriate corrective actions. It is highly recommended to complement it with periodic public opinion polls (re-users).

13. PROMOTION ACTIONS FOR RE-USE: Offering of various documents and materials, both informative and of strategic and technical character encourage the use of OGD. Speeches, workshops, seminars, applications contests, are some of the initiatives that government must have available in a systematically, to support developers and data reuse. Likewise, the recommendation is to publish successful stories, of great impact in the portal site, with metrics that establish the benefits and impacts that they had for users if possible.

14. EXISTENCE OF A CHANNEL FOR COMPLAINTS AND CONFLICTS RESOLUTION: The portal must have at least a form available with clear instructions, helpful to canalize developers and users difficulties with data reuse. This mechanism will be essential to improve aspects related to the reuse.

15. EXISTENCE OF A FORMAL CHANNEL OF PARTICIPATION AND COLLABORATION OF CIVIL SOCIETY: As mentioned above, participation and cooperation of citizens should be the cornerstone of any OGD project to ensure its success. Procedures and verification of opinions and suggestions must be available for consultation before future improvements. Opinions should have a rating system (public vote).

4 Conclusions

One of the recurrent elements in the bibliography is the one related to political leadership, cited as critical to a successful OGD implementation. It is an element present in all the proposals of OGD implementation plans. This element also emerges as one of the weaknesses found in the OD-MM maturity model application, and all OGD experts polled emphasize it as well, so its presence is natural in the ODIG.

The new elements in the actions proposed by the ODIG are the formulation of OGD training plans, the formulation by the PA of a strategic OGD development plan, and having a performance evaluation system of OGD projects, including the development of a PMO.

The experience of applying a pilot to six PAs in three Latin American countries, demonstrates that the presented ODIG, assumes its weaknesses detected in the diagnosis of these PAs. Therefore, when following the actions proposed by ODIG, these PAs will reach level 3 of maturity, or very close to it (from a maximum of 4), for sure.

Acknowledgements. The authors would like to thank Gonzalo Valdes, Gastón Concha, Cristián Torres, and José Gleiser for their work in the project. This work was partially supported by the grants DGIP 241142, International Development Research Center (IDRC/CDRI) with the collaboration of Inter-american Organization for Higher Education (OUI).

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Participatory Data Gathering for Public Sector Reuse: Lessons Learned from Traditional Initiatives

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Abstract. Local governments are increasingly looking for new ways to involve citizens in policy and decision-making, for example by combining public sector data sources with data gathered by citizens. Several examples exist of data gathering where personal mobile devices act as data collectors. While these efforts illustrate the technical capability of data sourcing, they neglect the value of local knowledge where people use their senses to capture and interpret data. Traditional data gathering initiatives, however, exploit this local knowledge to inform policy makers, e.g., neighborhood policing. To understand data gathering processes of these traditional data gathering initiatives, three cases are examined. We analyze these cases, focusing on the various elements they contain, concluding how digital data gathering can be informed by these traditional variants, concerning what the benefits of using digital means can be for data gathering and how traditional initiatives ensure data re-use by the public sector.

Keywords: Data Gathering, Participatory Citizenship, Local knowledge, Open Data.

1 Introduction

Local governments aim for new forms of policy and decision-making processes, with an emphasis on greater citizen involvement and participatory government, where active partnerships and collaboration between citizens, the private sector and the municipality are stimulated [1]. Internet has shown to be a promising platform for eParticipation [2] and local governments are increasingly using digital tools to inform and communicate with citizens [3]. This is also manifested in the many 'Open' movements, e.g., in Open Data Initiatives, where government data is released for re-use [4].

In this paper we focus on how traditional data gathering initiatives can inform digital means of data gathering, with the data being re-used by the public sector to contribute to policy and decision-making, and how data gathering can benefit from digital tools. Digital means that enable people to passively gather data are emerging, among others to map noise pollution [5] indicate quality of roads [6] or congestion [7]. These

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 87–98, 2013.

examples highlight how mobile devices can be used as data gathering tools. Involving people as carriers of such sensors can be seen as successors to traditional forms of data gathering. However, in contrast with digital data gathering, traditional initiatives use human senses and intelligence to observe and interpret local events, such as crime prevention initiatives, where people walk inspection rounds to map neighborhood safety [8]. Digital means might help overcome disadvantages of traditional data gathering like data credibility, non-comparability of data, data in-completeness and logistical issues [9]. Yet, traditional data gathering approaches, still offer certain advantages such as making better use of qualitative knowledge imbedded in communities [10][11]. In this paper we explore what digital data gathering processes can learn from traditional data gathering initiatives, to inform local governments on the organization of digital data gathering initiatives and empower people to gather data in collaboration with local authorities to contribute to policy and decision-making. Our research question for this study is: *How can digital data gathering processes benefit from traditional data gathering initiatives?*

The remainder of the current work is structured as follows: Section 2 describes other data gathering projects exploiting the potential of emerging technologies and discusses the value people can contribute to data gathering initiatives, distinguishing initiatives involving people as mobile sensor carriers as well as those involving people as sensors. Section 3 introduces our approach and provides an overview of the cases studied. In Section 4 we present our findings from the multiple case studies and describe important elements in traditional data gathering initiatives. Section 5 discusses how these elements can inform digital data gathering, the challenges associated with it, the benefits of using digital means, and ensuring data re-use by the public sector. In Section 6 we elaborate on directions for future activities.

2 Related Work

Benefits associated with involving citizens through data gathering are widely acknowledged in decision making, planning, and policy development [9][11][12]. These benefits include education of citizens [9][13], cost effectiveness [14], or having access to information that non-residents might not be aware of [15]. Also, when given training, citizens can provide high quality data using less expensive methods [16].

The increased availability of mobile devices and emerging technologies has encouraged projects where data is collected digitally. These include Pothole Patrol [6], where sensor data submitted by smartphones is used to assess road quality, the Copenhagen Wheel [7], where sensors attached to city bicycles submit pollution, road conditions and congestion data, or data mining uploaded photos to map tourist movement [17]. Gathering data in a digital way improves the validation of results and increases access, in addition to offering better ways of exploring and communicating findings about the data [9]. This type of data carrying refers to ‘citizens as mobile sensor carriers’, where submission and gathering of data is digital, and citizens do not actively decide what to submit. Although these examples illustrate the technical possibility of submitting or analyzing mined data, they do not necessarily make use of

local contextual knowledge found in communities. Firsthand experience, sometimes only available to local residents, can be important to experts in planning or developing policy [18][19][15].

Digital data gathering stands in contrast with more traditional efforts of data gathering, for example logging water quality [16], hunters providing wildlife samples [15], monitoring pollution with bees [14], or the three cases introduced in this paper. Within this category, data gathering has traditionally been analog and people apply contextual knowledge while gathering data. In this 'citizens as sensors' category, citizens actively contribute to the data collection, by gathering data through their senses, and applying contextual knowledge when finding facts.

Due to the benefits of technology, as mentioned earlier, examples of 'citizens as sensors' enabled by digital means are appearing. One such example is FixMyStreet [20], where citizens can log problems in the public space, such as broken lanterns or pavements. Here, citizens, empowered by digital tools sense data and apply contextual knowledge and judgment on what is being logged and submitted.

In this 'citizens as sensors' category, the information is mostly qualitative, as a result of life experience and is instrument independent [11]. Given this, data gathering, validation, and testing by local residents differ largely from the methods and techniques of professional practitioners. Despite evidence that local knowledge can offer valuable insights, the differences in methods and techniques can cause professionals to view the public as having either a deficit of technical understanding or as solely complementing the work of experts [21], while data credibility, logistical issues, non-comparability and incompleteness of data [9] are cited as issues, posing a challenge for 'citizens as sensors' initiatives.

Co-production could be an approach to overcome disagreement about credibility, validation and testing methods and techniques [22], since all stakeholders are accepted as potential contributors and hard distinctions between expert and novice are rejected. Joint fact-finding, in turn, similarly assists in increasing data credibility, while also contributing to more cohesive relationships among stakeholders and a better understanding of differing views [23].

With the advantages of 'citizens as sensors' approaches, combined with using digital means to gather, store and analyze data, we propose examining existing, successful traditional data gathering initiatives. We introduce an analysis of the processes these initiatives currently use, to inform digital initiatives and better understand re-use by the public sector of the data gathered by these traditional initiatives.

3 Approach

In order to understand the human involvement in analog data gathering initiatives, a multiple case study approach was used to study traditional data gathering initiatives within real-life contexts [24]. This case study setup allows us to analyze within and across settings, to understand similarities and differences between cases [25].

3.1 Case Introduction

The three cases are set in Rotterdam, the second largest city in The Netherlands. They were selected based on a predefined set of criteria: (a) it is an initiative where citizens use their senses to gather data, (b) ownership of the initiative lies with citizens, and (c) the data is gathered to influence local policy and decision making. The cases are briefly described below.

Case 1, Drugs in Color (DC): This initiative attempts to lower drug related nuisance. Groups of trained volunteers walk together with police officers, representatives of housing corporations and community workers in inspection rounds through the neighborhood. They search for predefined 'drug-related objects' and rate their observations according to a five-step analog color standardization.

Case 2, Housing Report (HR): To better understand housing shortages, a neighborhood led initiative was started to identify the causes of a lack of living space. To do so, an objective researcher, together with the local council, social housing company and statistical bureau of the municipality, analyzed data about the situation. This research was complemented with qualitative interviews with neighbors.

Case 3, Citizen Blue (CB): Residents patrol the neighborhood, in collaboration with the municipality, public maintenance service and local police to increase safety and foster social cohesion. During inspection rounds, volunteers map if the neighborhood is clean, intact and safe, i.e. by paying attention to overflowing dumpsters, broken streetlights and drug dealing. Observations are reported over a handheld tranceiver and are summarized by a trained citizen and depending on the origin of the issue, presented to the authority responsible.

Table 1 presents an overview of the three cases, their goal, type and frequency of data gathering as well as the actors involved in the initiatives.

Table 1. Overview of the three cases analyzed

	Drugs in Color (DC)	**Housing Report (HR)**	**Citizen Blue (CB)**
Goal	Stop long-term annoyance of drug nuisance in the neighborhood	Raise attention for the housing shortage in the neighborhood	Stop long-term annoyance of disturbance in the neighborhood
Data	Quantitative	Quantitative & Qualitative	Qualitative
Frequency	Quarterly	Non-recurrent half year project	Once every two weeks
Supporters	Community worker, Local Police	Community center	Community center, Local Police
Gatherers	Concerned citizens	Independent researcher	Concerned citizens
Interpreters	Independent interpreter	Independent researcher	Trained citizens
Data Recipients	Municipality, Local police, Housing corporation	Local residents, Municipality, Housing corporation	Municipality, Local police, Housing corporation, maintenance service

3.2 Data Collection

From each of the case studies we derived a large amount of data, in the form of direct observations and raw interview material. Observations of each case were documented and analyzed, mapping the actors, triggers for data gathering, data transactions and the level of data enrichment during every transaction. Analysis of all three cases were compared and led to insights in the process steps of traditional data gathering initiatives. Interviews were conducted with members of citizen initiatives (n=5), community workers (n=1), members of municipality (n=6), data gatherers (n=9), independent researchers associated with data gathering (n=2), local police (n=3), and were transcribed, interpreted and up to a total of 433 statement cards were categorized. Statement cards show quotes, interpretations and paraphrases of the data found in our interviews and observations. This method allows a team to collectively organize and reorganize data to discuss interpretations, observe similarities and draw conclusions [26]. The actor analysis together with the statement card analysis led to an overview of their gathering processes and six elements that distinguish these processes.

4 Findings

4.1 Actors in Traditional Data Gathering Initiatives

From the analysis we identified, process supporters, data gatherers, data recipients and data interpreters, a set of actors that were found in all cases examined. Process supporters, like a community worker, are actors who organize the process and give guidance to the other actors in the process, while they can also give legitimacy to an initiative. Data gatherers are the actual data gatherers, citizens who actively gather data in their local environment. Data interpreters, receive, interpret and enrich the data gathered, after which they provide the other actors with verbal, written or visual feedback. This role is largely determined by the ability and expertise to analyze and add value to data.

4.2 Processes of a Traditional Data Gathering Initiative

To illustrate a traditional data gathering process we describe the process of the DC initiative. First, the community worker is triggered by the complaints of drug nuisance in the neighborhood and organizes inspection rounds. The method of data gathering is standardized, allowing the initiative to be taken seriously by local authorities and to receive their support. The community worker continuously plans inspection rounds and motivates citizens to participate. In the second step, citizens actively gather data and give the data to the community worker. While walking the inspection rounds, citizens are supported by local police, who can directly intervene when necessary and can ensure the safety of data gatherers. In the third step, the community worker (re)arranges the data and gives the data to the autonomous chairman. In this stage, the data is only synthesized and not enriched. In step four, the chairman analyzes, interprets and enriches the data, after which he provides the recipients with feedback (step

five). This feedback is given in the form of a quarterly feedback meeting, where data serves as a tool to form a common vision. The feedback meetings are attended by local authorities, i.e. police officers, representatives of housing corporations, members of municipality and community workers, and the data is presented in a presentation that all actors can understand. Everyone receives the same information and local authority directly provides feedback on solved or unsolved matters and explains underlying causes based on their domain expertise.

The other two cases were analyzed accordingly and the process steps of the cases were identified. These process steps were abstracted and merged into our presentation of these traditional data gathering processes (figure 1).

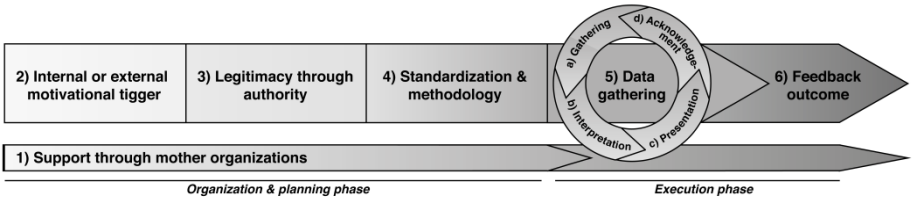

Fig. 1. Representation of traditional data gathering processes

4.3 Elements Identified as Important in Traditional Data Gathering Initiatives

In this representation of traditional data gathering processes we define six elements: (1) support through mother organizations, (2) internal and external motivational triggers, (3) legitimacy through authority & partnerships, (4) standardization & methodology, (5a) data gathering, (5b) data interpretation, (5c) data presentation, (5d) data acknowledgement and finally, (6) feedback about short, mid and long-term outcomes. Below we elaborate on each of these elements.

Support through Mother Organizations. Mother organizations understand existing social structures, have access to communication channels and have ties with local authorities. The three examined cases all built on local neighborhood collectives, which acted as a launch platform for the gathering initiatives. They offered access to potential subsidies and domain experts due to their existing network. In our cases, mother organizations initially acted as catalysts for data collection, after which they all became semi-autonomous working groups within the community organization that also undertakes other community actions.

Internal and External Motivational Triggers. Actors within the mother organizations of the cases, articulated a local problem that formed the trigger and main motivation to start gathering data. DC was triggered by the degree of problems caused by drugs in the neighborhood, whereas in HR, the lack of suitable housing motivated residents to hire an objective researcher, while CB came into existence as a result of

high levels of crime and public problems in the neighborhood, in combination with dissatisfaction with the action undertaken by local authorities to combat the issues.

Legitimacy through Authority and Partnerships. A central issue for gatherers was the need to have data taken seriously. Through interviews with public sector organizations involved with data gathering (police, local council, bureau of statistics or environmental protection agencies), we found that these organizations have specific data norms they adhere to. To assure legitimacy, groups involved local authorities or trusted third parties. In the case of DC and CB, the police, local council, housing corporation actively partake in the project, while stressing their non-ownership. The HR research was performed by an objective third party with domain knowledge, while the housing company provided statistics for the researchers.

Standardization and Methodology. In order for qualitative measurements to be usable by external organizations, actors must agree with standardized measurements. It was important that data gatherers involve, or consult the earlier mentioned objective third parties, to decide together what will be measured and how the data will be gathered, i.e.; with a digital camera or notepad. In DC, this occurred at the initial phases of the project, when a decision was made about the types of nuisances to record, when to record them, and how they should be classified in the system. Similarly, HR worked in collaboration with all actors to understand how the types of data recorded and presented by the social housing company, the council, and the statistics department can be interpreted. CB also agreed on the types of data being collected and how disturbances in the public sphere could be recorded.

These four elements conclude the organization and planning phase of the process. What follows are two potentially iterative and repeating elements: active gathering and feedback.

Data Gathering: ***Gathering, Interpretation, Presentation and Acknowledgement.***
Gathering: The initial active element is physical data collection, where citizens gather data using the chosen standardization and methodology. During this process they are supported by trusted third parties or involved authorities. The degree of support offered can vary from participating in inspection rounds, to education and logistical support. Notable during this step is the pre-interpretation and decisions made by gatherers to not capture certain data because of contextual knowledge. This includes the occurrence of homeless persons that are not considered a nuisance (DC), tolerance towards broken up street areas as a result of construction work (CB), or reliance on storytelling (HR).
Interpretation: Having gathered the data, a certain amount of data interpretation is needed in order to gain insights. This interpretation is either done by a trained volunteer, or a paid professional. Local authorities can also take a role, by offering domain expertise, as is the case with DC, where police officers actively explain certain drug related issues. In our cases, care is taken during the interpretation phase to guarantee data quality and validity, making sure the data retains its legitimacy.

Presentation: Following the interpretation, actors are presented with the gathered data in a tailored form. This might include graphs, statistics or text summaries. Results were compared to earlier data gathering moments or data supplied by local authorities. Presenting insights in the presence of third parties and local authorities enabled discussion and clarification of the data by domain experts. For example HR used a special neighborhood newspaper for direct stakeholders, combined with a special supplement in the local newspaper for other interested parties. CB, in contrast keeps track of data using a spreadsheet, centrally visible at the physical gathering place. The data is also communicated to the appropriate authorities, either whilst attending, or via email. These platforms are also notable for including data that is logged during un-official sightings, occurring outside the regular times of data gathering.
Acknowledgement: The acknowledgement phase, introduces the last iterative step in the data gathering element, where local authorities react to the gathered data in short feedback loops. This is an important element, since it is an acknowledgement of the effort of gathering, and can act as a motivator. Additionally it has a controlling function to make sure that action is planned, although it does not necessarily include active change. To illustrate, CB sends their reports of the week's activities to the local authorities and informs gatherers about the prospective feedback by the council. DC chose quarterly meetings to get the feedback of local authorities, where HR received feedback on their gathering at a final event where the report was presented.

Feedback about Short, Mid and Long-Term Outcomes. This final element of the process is the outcome of data gathering initiatives. During this phase, we define short-term, mid-term and long-term outcomes. At the very least, as a short-term outcome, common ground is hoped for from which understanding about the problem is cultivated from both sides of the issue. Mid-term outcome focuses on the concrete actions. This might be a more pro-active approach to garbage collecting, alternative route suggestions for police patrol, or more inspection rounds in certain areas. Long-term outcomes can mean lower crime or a behavior change of one of the parties involved. In the case of DC, the data gatherers have a better understanding of the issues facing the police, while in HR, parties understand the problem better due to the increased availability of information.

This section presented an analyzed process of traditional data gathering by citizens, where people apply community knowledge by gathering data, enabling gathered data to be re-used by the public sector. In the following section, we discuss how this process can inform data gathering with digital means, in addition to what the benefits of using digital tools and techniques might be.

5 Discussion

As mentioned in Section 2, local knowledge during data gathering can yield important insights [9][11][19]. Issues like differing methods and techniques [21], data credibility, logistical issues, non-comparability and incompleteness of data [9] can prevent the

data gathered from being re-used by the public sector. Digital means of data gathering offer advantages such as the ability to better validate results, increased access, in addition to better means of exploring the data and communication about the findings [9]. Digital means may be exploited to support and accelerate traditional data gathering initiatives, while the lessons learned from traditional gathering initiatives may be beneficial to digital means for data collecting purposes. As we have observed, contextualizing collected data is important in the interpretation of the data, to retain community knowledge. A major challenge of digital means for collecting purposes is to capture and process the context that pertain to data, i.e., to contextualize data.

Digital means potentially solve traditional logistical issues by offering automatized processes, potentially resulting in efficiency and cost gains. Where the triggers for traditional data gathering are mostly introduced by local mother organizations, digital means can likewise allow likeminded but scattered groups to connect, which is beneficial. Also, digital means may bring emerging triggers to attention. By processing large amounts of collected data real-time, emerging phenomena may be exposed, serving as early warning triggers for local authorities [9].

Traditional data gathering initiatives however, have proven to be effective and rely on human senses and insight in addition to having their data re-used by the public sector. We ascribe this partially to the support of underlying mother organizations, which function as backbone of traditional data gathering initiatives. Digital data gathering initiatives on the other hand are loosely bound together by common interest, but without backing of an existing mother organization, it may prove challenging to have the same level of logistical support and connections as traditional initiatives. Furthermore, local authority commonly is not the initiator of data gathering, but is often attracted by the mother organization to collaborate in a later stadium, offering valuable feedback and legitimacy. Not having legitimizing partnerships in digital initiatives can make outcomes uncertain and can be a hurdle to realize change, since it is important to communicate that authority supports the data gathering initiative and that a valuable outcome of some sort is guaranteed to volunteers. Attracting an objective trusted third party that can act as the 'face' of the initiative could substitute the absence of a mother organization, since it can provide access to an existing community and can address local authorities to lend legitimacy to the data gathering initiative.

When actively gathering data, digital means offer the potential to allow incidental, ad-hoc measurement, for example through using a smartphone on location, rather than data measuring during predefined walks through the neighborhood. Moreover, digital standardization cannot be influenced by human inconsistencies and can increase the possibility to gather more credible, complete and comparable data [9]. However, care must be taken to allow human observations and interpretations into the methodology determination. Choosing and agreeing on standards and methods is important, since qualitative information gathered by citizens as human sensors is valuable in traditional data gathering. However, involving qualitative information increases complexity, making the training of data gatherers crucial to assure data credibility. In traditional initiatives this preceding training and support during data gathering is provided by mother organizations, which in the digital case would entail different type of support, such as a tutorial. Moreover, traditional efforts in our cases involve authorities in

gathering the data from the field, enabling joint fact-finding, which can be beneficial for the relationship among actors [22].

In the examined traditional data gathering initiatives, interpretation of the data plays a major role and is often done by an objective trusted third party, making on-the-spot clarification possible. In digital efforts transparency about this process is also important, giving participants insight into how data is translated, compared and combined. It must be clear who presents the data, a role that can be fulfilled by an objective third party who is trusted by all stakeholders to interpret and communicate the results. Digital means make it easier to combine and compare data sets from different stakeholders, and just like in traditional means, to be presented to all stakeholders in an understandable and transparent way. Furthermore, an analysis of combined data sets results in a more comprehensive description of a phenomenon compared to an analysis of a single set. Digital variants could benefit with near-instant translation and presentation of results, but might lack the ability to consult domain experts on why results are translated and presented in a certain way. Providing certain methods of consultation on data interpretation can make this process more transparent.

However, adequate acknowledgement of local authority on the data collected stays important. In traditional initiatives local authorities give data gatherers credit in the form of appreciation of their efforts, resulting in engaged and active participants. In line with the importance of the element of acknowledgement, we note that providing data gatherers with feedback about short, mid and long-term outcomes, even when change has not been realized, empowers citizens and acknowledges their efforts. Similar efforts in digital data gathering initiatives would be beneficial.

Finally, we emphasize the need to be transparent in cases of automatic digital data gathering. In our examined cases, participants actively participate, with full knowledge of the data collection and intent. This transparency remains important in digital data gathering initiatives.

6 Conclusion and Future Work

Digital data gathering has taken a leap and already has shown the potential of supporting citizens to contribute to policy and decision-making processes. Local governments express the need to be informed by citizen data, but are not familiar with the organization of digital data gathering processes. In this paper we propose that digital data gathering can learn from traditional data gathering initiatives that have proven to be effective. We also argue that traditional means stand to benefit from digital tools and techniques. A traditional data gathering process with six elements that can serve as guidance for local governments is presented, to achieve this.

We aim to contribute to the efforts of combining government data and citizen gathered data for public sector reuse to contribute to policy and decision-making. Also important is the potential of data gathering to build better relationships between authority and citizens through joint fact-finding. Due to the limited amount of cases, we emphasize that the presented process elements need to be tested in future research.

Our own efforts will focus on the standardization and methodology, where we aim to investigate how existing standards, as determined by government, can be translated to measurement standards that can incorporate human knowledge, whilst still retaining legitimacy of the data. With the development of a use case based on the data gathering demand articulated by local authorities in Rotterdam and an accordingly selected target group, we aim to develop a mobile application according to an iterative research and design approach.

Acknowledgements. We thank our colleagues of the Rotterdam University involved in the Rotterdam Open Data project and the participants for this study. The work has been partly funded by SIA RAAK Publiek.

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Linked Open Government Data Analytics

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Abstract. Although the recently launched Open Government Data (OGD) movement promised to provide a number of benefits, recent studies have shown that its full potential has not yet realized. The difficulty in exploiting open data seems surprising if we consider the huge importance data have in modern societies. In this paper we claim that the real value of OGD will unveil from performing data analytics on top of combined statistical datasets that were previously closed in disparate sources and can now be linked to provide unexpected and unexplored insights. To support this claim, we describe the linked OGD analytics concept along with its technical requirements and demonstrate its end-user value employing a use case related to UK general elections. The use case revealed that there is a significant relationship between the probability one of the two main political parties (i.e. Labour Party and Conservative Party) to win in a UK constituency and the unemployment rate in the same constituency.

Keywords: Open government data, linked data, statistics, data analytics.

1 Introduction

Open data refers to data that *"can be freely used, reused and redistributed by anyone"* [1]. During the last years, an increasing number of governments and public authorities have started to open up their data. The so-called Open Government Data (OGD) movement has resulted in the launch of numerous OGD portals that aim at providing a single point of access for governmental data [2].

OGD have promised to provide a variety of benefits to society such as to increase government transparency and accountability, stimulate innovation, contribute to economic growth and improve administrative processes [3]-[4]. However, a recent empirical study concluded that a simplistic view is often adopted with regards to open data, which automatically correlates the publicizing of data with use and benefits [3]. In practice however, gaining access to raw data, placing it into a meaningful context, and extracting valuable information is extremely difficult. As a result, during the last couple of years different solutions have been developed to support the whole lifecycle of OGD reuse i.e. data discovery, cleaning, integration, browsing and visualization (e.g. [5]-[6]). However, despite the huge efforts that have been put into supporting

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 99–110, 2013.

both OGD publishing and consuming, the OGD movement has not yet realized its expected potential.

The difficulty in exploiting open data seems surprising if we consider the huge importance data have in modern societies. Indeed, during the last years, businesses, academia and government employ various data analytics methods on their own data with great success. For example, business intelligence methods are employed by enterprises to help them survive in the global economy [7]. In addition, evidence based policy-making relies on data analytics to assist policy makers in producing better policies [8]. Finally, academia employ data analytics to test hypotheses, understand patterns, predict future points, estimate hidden parameters etc. in various domains and problem areas [9].

We claim that the real value of OGD will unveil from performing data analytics on top of combined statistical datasets that were previously closed in disparate sources and can now be linked in order to provide unexpected and unexplored insights into different domains and problem areas.

For this purpose, we deem that the *linked data* paradigm must be first adopted for constructing the technical infrastructure that is essential for employing data analytics in a decentralized manner on the Web. The term linked data refers to *"data published on the Web in such a way that it is machine-readable, its meaning is explicitly defined, it is linked to other external datasets, and can in turn be linked to from external datasets"* [10]. Currently the most promising implementation of linked data is based on Semantic Web philosophy and technologies but in contrast to the full-fledged Semantic Web vision, it is mainly about publishing structured data in RDF using URIs rather than focusing on the ontological level or inferencing [11].

The objectives of this paper is to (a) introduce the concept of data analytics on top of distributed statistical linked OGD (b) describe the technical prerequisites that will enable the effective exploit of statistical OGD in data analytics and (c) demonstrate the end-user value of the linked OGD analytics approach based on a case study that is related to the general elections of the United Kingdom (UK) using data from data.gov.uk, the official UK's OGD portal.

The remaining of the paper is organized as follows. In section 2 we describe the concept of data analytics based on open and linked government data. In section 3 we describe the technical prerequisites for realizing this vision. Section 4 presents the results of an analysis use case related to the UK general elections. Finally, in section 5 the related work is presented while in section 6 conclusions are drawn along with future work.

2 The Concept of Linked Open Government Data Analytics

A big portion of Open Government Data (OGD) concerns statistics such as population figures, economic and social indicators. Major providers of statistics on the

international level include Eurostat[1], World Bank[2], OECD[3] and CIA's World Factbook[4]. Moreover, public agencies at all administrative levels collect, produce and disseminate statistical data through their OGD portals. Accurate and reliable statistics provide the solid ground for developing models that could support academia to better understand the world and businesses to make better decisions. These models enable the identification of patterns, prediction of future points and estimation of hidden parameters.

The availability of accurate and reliable statistical OGD in formats that enable easy reuse and combination can provide new potentials to businesses, academia and governments. The combination of statistical OGD that refer to different domains and is published by different public authorities with other data (e.g. enterprise's own data) could enable creating and evaluating models that were previously hard or even impossible to develop.

The potential of performing analytics on top of combined OGD and third party data could be summarized in the following user stories:

"As a business manager I want to be able to combine enterprise's data with accurate and timeliness demographics, economic and social indicators in order to make better decision regarding business operations and strategies". For instance, the correlation of product sales with economic and social indicators in various locations can reveal valuable information regarding consumer behaviour, hence supporting marketing or logistic departments.

"As a researcher I want to be able to combine statistical data from disparate sources and domains in order to empirically identify novel hypotheses or test existing ones with more data as well as to understand patterns, predict values and estimate hidden parameters". For instance, developing models that integrate biodiversity information from a variety of datasets to assess biodiversity change, including remote sensing and in situ observations.

"As a policy maker I want to be able to combine statistical data regarding economic and social indicators in order to identify evidences regarding policy interventions and hence evaluate policies." For instance, the correlation of data about education, unemployment and criminality in different geographical or administrative units and different time intervals could support or challenge existing policies.

However, putting together statistics in a meaningful manner so that to enable the creation of added value is usually a labour intensive task that introduces significant burdens to data users. It requires the manual *discovery, collection*, *cleaning*, *transformation*, *integration*, *visualization* and *statistical analysis* of data. The vision that we present in this paper suggests shifting this effort from the end-users to the data providers enabling this way the easier and wider reuse of statistical OGD in various problem areas. As a result, statistical OGD will be openly available for reuse in a way

[1] http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes
[2] http://data.worldbank.org
[3] http://www.oecd.org/statistics/
[4] https://www.cia.gov/library/publications/the-world-factbook/index.html

that will facilitate the performance of data analytics on top of combined open data and thus will enable the creation of useful information in an easy and cost effective manner.

For this purpose, the data should be provided in such a way that facilitates the whole lifecycle of statistical data reuse:

Data discovery: Metadata that describes statistical data should facilitate the effective and easy identification of datasets that could be combined for statistical analysis. This includes the identification of datasets that share common joint points (i.e. parliament constituencies, local authorities, schools etc.) and thus allow for further analysis. For instance, it is not feasible to correlate schools' expenditures with hospitals' inpatients because there are no joint points between them. In addition, it includes the identification of datasets that describe variables measured using similar categories of units e.g. continuous or discrete. Finally, the metadata should enable the identification of variables of a specific category or class.

Data cleaning: The statistical data should be of high quality i.e. timely, accurate and relevant.

Data linking: The data should be linked in order to enable analysis in different levels of granularity e.g. unemployment that refer to parliamentary constituencies' level with criminality that refer to local authorities' level. Data linking should also facilitate the disambiguation of entities, concepts, units, codes etc. that are described in the datasets.

Data visualization and statistical analysis: The data should enable easy visualization and statistical analysis. Towards this end, the provided data should facilitate the automatic identification and matching of the unit of measurement of the described variables. This will allow the automatic visualization and selection of the method to be used for the statistical analysis. For example, in the case of continuous units data analytics could be performed through linear regression analysis while in the case of discrete unit (i.e. categorical measures) through a classification analysis method such as logistic regression.

3 Technical Prerequisites

In order to realize the vision of linked open government data analytics as it was described in the previous section a number of technical prerequisite should be met.

The main assumption is that the statistical data is published as linked data in order to enable the combination of datasets that are published in disparate sources on the Web. This includes publishing the data following the linked data principles as well as establishing typed links at the instance and schema level. However, both the publishing and linking of the statistical data should be made in a statistically rigorous manner. Statistical data should be modelled as data cubes that describe data in a multi-dimensional fashion. Towards this end, the RDF data cube vocabulary can be employed [12]. This vocabulary is currently a W3C candidate recommendation for modelling multi-dimensional data, such as statistics, as RDF and thus adhering to the linked data principles. Although more vocabularies have been proposed in the area

(e.g. the Open Cube vocabulary [13]), RDF data cube is the most popular and stable one.

Data cubes are characterised by their *dimensions*, their *measures* and possibly by additional *attributes*. The dimensions in the cube define what each observation is about. For instance, a cube related to unemployment might have the following dimensions: location, time period, gender and age group. An individual observation refers to a unique value along each of these dimensions. In the unemployment example, a single observation would define the unemployment rate of women (*gender*) between 22 and 30 years old (*age group*) that live in Kensington (*location*) for the first six months of 2009 (*time period*). The possible values for each dimension are taken from a *code list*. A code list is a controlled vocabulary such as a list of constituencies in the UK or possible age groups. The measure defines what kind of quantity is being measured e.g. the unemployment rate. An observation could also have attached attributes, which facilitate the interpretation of the observation value e.g. the unemployment rate is measured as percentage and is an estimation of the Ministry of Labour.

Moreover, the data that has been modelled based on data cubes should be also connected through typed links (e.g. owl:sameAs property) at the instance level in the following joint points:

- Dimensions definitions: This will enable the identification of datasets that share at least two common dimensions and thus can be considered for comparative statistical analysis and visualization. Only datasets that share at least two common dimensions can be considered for analysis.
- The values of dimensions: This will enable the matching of observations that refer to the same values of the dimensions. For instance, the identification of the unemployment rate and the number of crimes that refer to the same parliament constituency e.g. Kensington.
- The categories of measures: This will enable the identification of measures of the same category and the analysis of variables that are linked to a number of different measures. Relevant measures should be categorized under a predefined set of categories enabling users to identify measures relevant to the research or business question.

In addition, well known statistical concept schemes, code lists and classifications should be employed in order to enable maximum reusability.

The representation of data as RDF cubes will enable the linking of data published in disparate sources and thus facilitating statistical data reuse and combination for performing data analytics.

However, we should also note the current version of the RDF data cube vocabulary does not enable the aggregation of data from different granularity levels along a dimension hierarchy and thus doesn't facilitate the comparative analysis of this type of data.

In summary, the proposed open government data (OGD) analytics framework capitalizes on linked data principles and thus assumes data is published as linked data and meets a set of technical prerequisites. Clearly, this assumption is not yet true for all OGD initiatives. However, it is true that from all different technologies approaches

for OGD, linked data seems the most promising and fast adopting [2]. Actually, in UK data.gov.uk was one of the first OGD portals providing data following the linked data principles [14]. In fact, we believe that our framework might act as a catalyst for further speeding the adoption of linked data paradigm.

4 The UK Elections Case

In this section we employ the use case of general elections in the United Kingdom (UK) in order to demonstrate the end-user value of the proposed linked open government data analytics approach. In particular, our aim is to demonstrate how one can gain insights about UK elections from available Open Government Data (OGD) that is published on data.gov.uk. Towards this end, we use as a starting point open data regarding the outcome of two UK general elections from 2005 and 2010. In particular we employ datasets that are published on Guardian's web site under an open license regarding the elections' results. In particular, these datasets contain the final results of all participating political parties in the country but also results of the main parties per parliamentary constituency along with the winning party per constituency. These datasets from Guardian's web sites were published as spreadsheets.

As it was described in the previous sections, in order to be able to perform data analytics on top of combined datasets we need to identify datasets that share the same dimensions. In the elections case, we need to identify datasets with statistics on data.gov.uk that describe data in the parliament constituency level. Towards this end, we searched and collected datasets regarding two categories, namely unemployment and poverty. For the former we have identified two datasets describing the unemployment and employment rate while for the latter two datasets describing the proportion of children in poverty and the families receiving child benefits. We identified datasets in different time periods from 2005 until 2010. These datasets was published on data.gov.uk as spreadsheets.

Before we proceed with the actual analysis, the data goes through a data conditioning phase in which all the datasets from both data.gov.uk and Guardian are being published following the linked data principles and based on the technical requirements that we have specified before.

We have created an RDF data cube for each measure. For instance, one cube has unemployment rate as measure and year and parliament constituencies as dimensions while another one has the percentage of children in poverty as measure and the same dimensions. We have also published the elections datasets as linked data and according to the same requirements. In this case we have as a measure the number of votes and as dimensions the years, parliament constituencies and political parties. We have also created a cube that describes the winning party as measure and parliament constituencies and year as dimensions. In order to disambiguate the dimensions we have created typed links between our datasets and DBpedia, the linked data version of Wikipedia. We have used owl:sameAs links in order to denote that an entity described

in our dataset is the same as the corresponding entity in DBpedia. In this way, it becomes possible to disambiguate entity instances.

Two types of links are being established. The first one refers to the dimensions level while the second one to the observation level. Figure 1 presents the structure of a small part of the RDF data representing the data cubes along with the links among them. In particular, it describes the data structure definition of the unemployment rate and the election results cubes along with one observation per cube. It also presents the links that have been established between the two cubes. At the dimension level the graph denotes that one of the dimensions in both cubes is same as the dbpedia:United_Kingdom_constituencies entity while at the observation level that one observation in both cubes refers to an entity that is same as the dbpedia:Kensington_(UK_Parliament_constituency) entity.

The final task is to annotate the described measure with a set of categories. In our case the elections datasets could be categorized under elections while the data.gov.uk datasets are being published based a predefined set of categories from the Office of National Statistics.

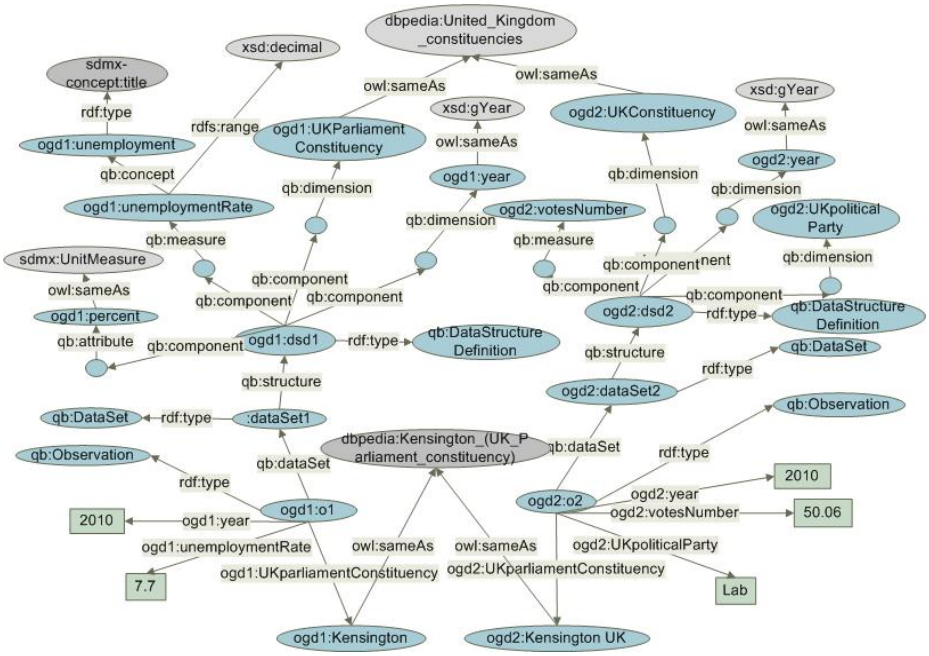

Fig. 1. A part of the RDF graph that presents two data structure definitions of two cubes along with two observations and the respective links between them

The data conditioning process gets the data into a state where data analytics can be performed in a transparent and easy manner. Initially, data that is related to elections can be discovered based on the category annotation. In our case scenario, two datasets that describe the number of votes and the winning party are discovered. Thereafter, datasets that share at least one dimension with the elections dataset are identified

through the typed links that have been established to other datasets. In our case these datasets describe unemployment and poverty.

In addition, the datasets describe that the measures has been computed in either continuous (i.e. number of votes) or discrete (i.e. winning party) units. So, the way of visualizing the data or even the statistical analysis method to be followed can be emerged from the unit that characterizes the measure. For example, in the case of continuous units data analytics could be performed through linear regression analysis while in the case of discrete unit (i.e. categorical measures) through a classification analysis method such as logistic regression. Logistic regression measures the relationship between a categorical dependent variable and one or more continuous independent variables, by converting the dependent variable to probability scores through the logistic function:

$$P(A) = \frac{1}{1+e^{-y}}$$

For example, in the elections case the logistic function could correlate the unemployment rate of a parliament constituency to the probability P(A) a particular political party to win the elections in the same constituency. On the other hand, the linear regression would correlate the unemployment rate of a parliament constituency to the number of votes that a specific political party received in the same constituency.

In our case we assume that the elections related dataset that includes a continuous measure is analyzed based on a linear regression while the one that includes a discrete measure based on logistic regression. The analysis can be also combined with a comparative visualization depending on the selected analysis method. The comparative visualization enables the easy understanding of the data analytics results and facilitates their interpretation.

In Figures 2 and 3 the visualizations of linked open government data analytics are depicted. These figures visualize logistic regression analyses for the winners per constituency datasets in relation to the unemployment rate per constituency datasets for two consecutive UK elections in 2005 and 2010. In particular, the visualizations depict the percent of constituencies of a particular unemployment rate in which a party has won the elections. For example, in Figure 2 in the diagram that refers to the 2005 elections we see that the conservatives did not win in any parliament constituency with ten percent (10%) unemployment rate.

In addition, as the same figure indicates for parliament constituencies with more than five percent (5%) unemployment rate the Conservative Party has very small probability to win. However, in the same Figure and in the diagram that refers to the 2010 elections the unemployment rate above of which the Conservative party has very small probability to win goes up to thirteen percent (13%).

These visualizations enable users to evaluate the performed analyses and thus to understand the correlation between measures described in different datasets. As Figures 2 and 3 suggest there is a significant relationship between the probability one of the two main UK parties (i.e. Labour party and Conservatives) to win in a parliament constituency and the unemployment rate in the same parliament constituency. It is notable that the same patterns holds for the two consecutive elections. The Conservative Party seems to win in areas that are characterized by small unemployment rate while the Labour Party in areas with high unemployment

rate. Here we should note that the average unemployment rate in 2005 was 3.35 percent while in 2010 7.5 percent. This difference in the average unemployment rate between 2005 and 2010 could explain the moving of the data points and the data pattern to the right in the case of the unemployment measure. Finally, we should note that other connections that could have been produced by visualizing or correlating other measures (e.g. poverty) are not presented in this paper for shortness.

The identified patterns as presented through visualization could be valuable for supporting decision-making. For example, political parties and candidates could intensify their campaigns in areas that the analytics predict negative results.

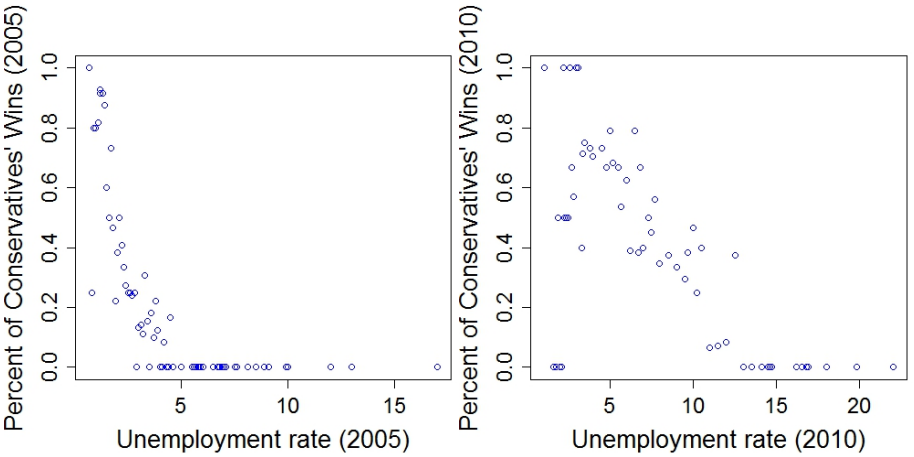

Fig. 2. The correlation of Conservatives' wins and Unemployment using the unemployment datasets for the general elections of 2005 and 2010

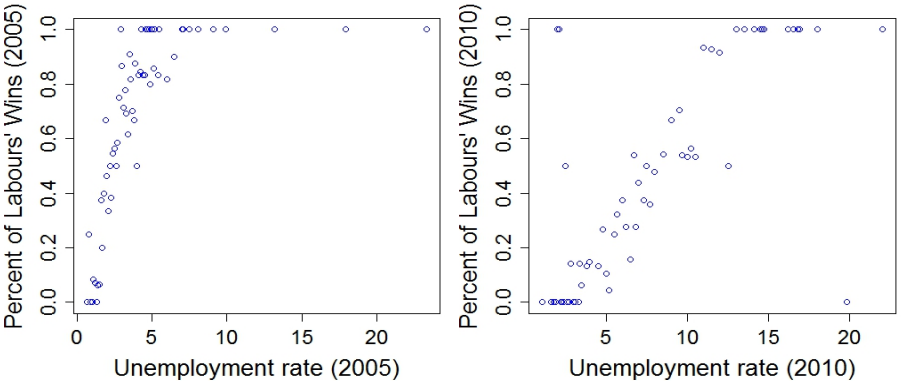

Fig. 3. The correlation of Labours' wins and Unemployment using the unemployemnt datasets for the general elections of 2005 and 2010

The presented approach also enables the creation of a statistical model out of the identified datasets. This can be used as a predictive model for estimating a future value of the dependent variable. For example, in our case one could create a model in order to estimate who will be the winner of a particular constituency in the future based on the unemployment rate at that time. Towards this end, we used R statistical package and we computed the coefficients of a logistic function. In particular, the model that correlates the probability P(A) the Labour party to win in a specific parliament constituency as a linear function of the unemployment rate of 2010 in the same parliament constituency using the logistic function is as follows:

$$P(A) = \frac{1}{1+e^{-y}}$$

where

$$y = -3.823 + 0.437 \times x$$

and x is the unemployment rate of the constituency. So for example, in constituencies with 12 percent unemployment rate the y variable is y=1.421 and the probability P(A)=0.8.

Therefore, based on this naïve prediction model and using a dataset that includes an estimation of the unemployment for 2015 we could also produce a prediction about the winning party in a particular constituency.

The UK elections case could also demonstrate the applicability of the linked open government analytics approach into a business setting where enterprise's own data could be combined with OGD. In this case the election results could have been replaced by product sales related data enabling this way the better understanding of an enterprise's sales.

5 Related Work

In the linked data community a few recent research endeavours worked on demonstrating the potential of linked statistical data. Towards this end, they showed how using linked data principles in statistical data for decision support services bears advantages such as easier integration and enrichment with other data sources [15]-[16]. They suggested that linking statistical data to the Linked Data Web could enable the enrichment of a particular dataset and thus the extraction of interesting and previously hidden insights related to particular events.

In particular, van Hage et al. [17] created linked data from piracy reports and employed statistical analysis to classify the events based on the weapons used. They also performed statistics on top of linked data in order to answer questions such as "what are the most active areas", "what are the differences in ships attacked in different regions" etc.

In addition, Paulheim [18] employed datasets that are published on the Linked Data Web in order to enrich statistical data with attributes e.g. from DBpedia. He showed through a prototype that these attributes could generate new hypotheses. This approach was implemented through a prototype and analyzed the perceived quality of these hypotheses in a case study.

However, the proposed in this paper linked open government data analytics approach describes the value and the prerequisites of combining disparate statistical datasets that could enable the identification of unexpected and unexplored insights into different domains and problems areas.

Similarly to OGD, open data is also created and disseminated through Social Media such as Twitter, Facebook, blogs and forums. This data differs from OGD because it mainly expresses subjective opinions and thoughts. Social media data has been used as a primary source for the creation of predictive analytics models regarding various phenomena such as elections, stock market and product sales. An analysis of 52 relevant empirical studies concluded that social media data should go through a data conditioning process, which is similar to the one that we have presented in the proposed linked open government data analytics approach [19]. The same study revealed that this kind of open data could be successfully used for the development of predictive models in various problem areas.

6 Conclusions and Future Work

During the last years the Open Government Data (OGD) movement has been introduced evangelizing the need to open up governments and public authorities data for everyone to reuse. The OGD movement promised that open data would increase government transparency and accountability, stimulate innovation, contribute to economic growth and improve administrative processes. However, recent studies have shown that the full potential of OGD has not yet realized, despite the significant efforts put into developing tools and application facilitating open data publishing and consumption.

Today, data that are closed into isolated systems are fed in data analytics methods and tools to provide valuable information to businesses, governments and academia. In this paper we claimed that the real value of OGD will emerge from performing data analytics on top of combined statistical datasets that were previously closed in disparate sources and can now be linked to provide unexpected and unexplored insights into different domains and problem areas. To support this claim, in this paper we describe the linked open government data analytics vision along with its technical requirements as well as we demonstrate its applicability and value using a use case related to UK general elections. The case revealed that there is a strong correlation between the unemployment rate in a constituency and the possibility one of the two main political parties (i.e. Conservatives and Labour party) to win the elections in the constituency.

Future work includes the development of a platform that will enable the semi-automatic identification of important relations between variables that are described in datasets published as open data by different sources or even with variables that resides in enterprise's own data and thus also demonstrate the value of the proposed framework in business settings.

Acknowledgments. The work presented in the paper is partly funded by the EU Grant No.288136 eGovPoliNet - Building a global multidisciplinary digital governance and policy modelling research and practice community.

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How to Support (Political) Decisions? Presentation of a Micro-simulation Model to Assess the Implications of EU-wide Tax Reforms

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Abstract. Current discussions of possible tax reforms are characterized by an increasing relevance of related governments' budgetary implications, thus, in this respect each tax reform proposal is reviewed in detail and an assessment of the consequences is essential from a political point of view. We developed the innovative micro-simulation model ASSERT (Assessing the Effects of Reforms in Taxation), which factors in changes in macro-economic conditions (GDP growth) as well as cross-border effects to analyze EU-wide tax reforms. To this end ASSERT is based on firm-level data, applies a forecasting algorithm and considers tax provisions for European countries. This paper presents the current version of the artifact as well as the development/evaluation process.

Keywords: Taxation Revenue Model, ASSERT, DSR, Simulation.

1 Introduction

In the recent past, a number of EU member states reformed their provisions governing company taxation. The German government, for example, changed the Corporate Tax Act in 2008 by drastically reducing the tax rate and adjusting other regulations in order to ensure Germany's tax revenue in the long term by preventing extensive profit shifting to other European or foreign countries [13]. The European Commission proposed the Common Consolidated Corporate Tax Base (CCCTB), an alternative EU-wide tax regime, in 2011 [7].

Against the background of the currently constraint governments' budgetary situation, which can be observed in many member states as a consequence of the recent financial and global economy crisis, each reform scenario has to be discussed, evaluated and reviewed in detail. Whereas the effects for small or stand-alone corporations can be assessed reviewed relatively easily, the evaluation for larger corporations and corporate groups, especially in an international context, has proven to be difficult. Those cases are characterized by complex cause-effect relationships and cannot be

* The micro-simulation model ASSERT has been developed by Andreas Oestreicher, Reinald Koch, Dorothea Vorndamme and Stefan Hohls, Georg-August-Universität Göttingen.

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 111–122, 2013.

determined manually, particularly if a reform proposal is to be evaluated from a political point of view. Complexity is further increased if changes in the macro-economic changes are taken into account.

To this end, we developed the micro-simulation model ASSERT, acronym for Assessing the Effects of Reforms in Taxation, which enables an assessment of the impact of alternative tax regimes for stand-alone companies and corporate groups (considering national as well as international relations) in the EU on tax revenue. In doing so, national tax reforms can be evaluate taking account of effects resulting from (inter-) national company relations as well as the CCCTB reform proposal. Factors determining future company development are applied by using a forecasting method, which is, to our knowledge, a novelty in this context.

We identified four main modeling challenges. Since micro-simulation models are based on firm-level data and the data source provides firm-level data for European companies in a standardized format allowing for a relatively low degree of detail, there is a need to generate more detailed data to apply tax provisions (1). In order to reflect changes in the general economic environment, a forecast routine of the companies' future development is essential (2). We need to include companies' behavior and interactions between companies in the model. This is done by anticipating, in the present version, ex ante companies' decision making with regard to making use of an available group taxation system or companies' financing (3). Strategic company decisions (e.g. location decisions) are explicitly not addressed. Finally, the tax provisions need to be modeled for all European countries as detailed as necessary and as standardized as possible (4).

The remainder of the paper is structured as follows: In Section 2 the related work concerning tax revenue models and Design Science Research is presented. The artifact development, with a special focus on necessary data and routines for forecasting companies' development, is the subject of Section 3. Subsequently, according to Design Science Research, the developed artifact are evaluated. Finally, Section 5 gives a conclusion and an outlook for further research.

2 Related Work

Based on the necessary input data as well as the accuracy, existing artifacts can be classified into macro-economic models and models, which process individual (micro-)data [22]. Although macro-economic models allow for the consideration of taxes, micro-simulation models are more suitable for assessing implications induced by tax reforms, because of the opportunity to explicitly process individuals' characteristics as well as more detailed tax-provisions [5,16,24]. Within micro-simulation models, two types of models can be distinguished [16]. Static micro-simulation models determine the tax liability by applying relevant tax provisions as detailed as possible to accounting data realized in the past. The simulation is processed both for the current tax regime and the respective reform proposal. By comparison of the simulated tax revenues, the different tax regimes can be evaluated. Existing micro-simulation models designed for the purpose of tax policy evaluation usually follow this approach.

The DIECOFIS model [20] is a one-period model and was applied for an analysis of an Italian tax reform. The German model BizTax [2] and the German TaxCoMM model [24] apply a static micro-simulation approach and quantified the impacts resulting from the German tax reform 2008 [1,9]. The above mentioned models are limited to a single country. Koch [15] quantifies the effects of alternative tax regimes (CCCTB) by applying an EU-wide static simulation model.

The static simulation approach avoids any estimation error involved with a forecasting algorithm. However, the results are only valid, if the determining factors are still applicable [16]. Contrastingly, dynamic micro-simulation models (as ASSERT) rely on forecast algorithms and are, thus, able to take account of changes in the macro-economic conditions, examples are the recent economic and financial crises. Dynamic micro-simulation models are not suitable to predict macro-economic effects but rather are based on macro-economic models in order to regard changes in macro-economic conditions, for example GDP growth. Although three approaches have been developed in the literature for forecasting (taxable) income [3-11] in a different context, dynamic simulation models are still absent.

The evaluation of tax reforms cannot be handled manually, thus, "Information Systems are implemented [...] for the purpose of improving the effectiveness and efficiency" [12]. In order to support the (political) decisions in an effective and efficient manner, artifacts are developed using design science [17]. For design science research, guidelines as well as process schemes are provided for developing and evaluating artifacts [12,21]. Besides, providing an artifact for a solution of an unsolved problem in a certain "problem domain" (usefulness), the design science research focuses on the development processes as well as the presentation of the insights [12].

The relation between the problem and the solution as well as development and evaluation process can be clarified by a paradigm. The "Problem Entity" represents corporations, corporations' behavior and governments' regulations which are elements of the reality. By modeling the reality a "Conceptual Model" is set up which is transferred by implementation and computer programming to a "Computerized Model", the instantiation. To obtain valid results, the processed data needs to be valid. Furthermore the "Conceptual Model" and the "Computerized Model" have to be reviewed, validated and updated if required [25].

3 Artifact Development

3.1 Tax Revenue Model

The governments' tax revenue (dependent variable) is determined in accordance with equation (1) as the extrapolated total of all companies' tax liabilities per country [19].

$$TaxRev_t = \sum_{c \in \text{country}} Tax_{i_c;t} \quad (1)$$

The companies' tax liability is defined by companies' taxable income (taxable income consists of earnings before interest, taxes and depreciation (EBITDA); extraordinary income (epl); depreciation (depr); financial income (fpl); received dividends (div^{rec});

application of group taxation (gt) and loss offset (lcf)) and the statutory tax rate (τ) as in equation (2) presented.

$$Tax_{i_c;t} = \left(ebitda_{i;t} + epl_{i;t} - depr_{i;t} + fpl_{i,t} - div_{i;t}^{\text{rec}} \pm gt_{i;t} - lcf_{i;t}\right) * \tau_{c;t} \quad (2)$$

The tax revenue model can be subdivided into five main steps. The companies' development is forecasted on a year-to-year basis. For the purposes of forecasting future companies' development, two sub-sets of data are created. Firstly, for each simulation company additional information, such as company specific interest rates, net investment, return on assets in year 2007 and probabilities of having an extraordinary income, are calculated. Secondly, we define the historical reference by calculating company specific forecast parameters and creating one referring dataset for each set of three consecutive complete financial statements within the period 2001 to 2006. In order to be able to determine depreciation expenses we need a detailed asset history sheet including the acquisition costs and the respective acquisition dates for different types of assets (machinery, buildings, land, goodwill and patents) [6,19].

In a second step, which is optional and has not been implemented so far, possible behavioral responses could be considered. The derivation of taxable income from forecasted accounting earnings (step three) consists of four sub-processes: dividend exemption, group taxation, inter-period loss offset, determination of final tax liability.

The fiscal treatment of financial income can be characterized as follows: While interest expenses and income are (fully) deductable and taxable, there are no tax consequences with regard to distributed dividends. Underlying profits are fully taxed at the level of the distributing company and, if both companies are incorporated, dividends are tax exempt (except for a lump-sum proportion) at the level of the receiving company (dividend exemption) in accordance with the parent countries' tax law. If companies belong to a tax group, the group's income (sum of EBT after dividend exemption) instead of individual's income is taxed. This may lead to a summing up of positive and negative results, i.e. an intra-group loss offset. If negative income persists also after group taxation, losses are offset across periods according to local tax law before companies' tax liabilities are calculated.

In step four, the liabilities and equity as well as distributed dividends are determined. Based on the companies' tax payments, governments' tax revenue is ascertained by applying an extrapolation routine at the end of the simulation.

3.2 Dataset Generation

The main data source is the AMADEUS[1] database provided by Bureau van Dijk. For each company, general characteristics (e.g., industry, date of incorporation) as well as financial information is provided in a standardized format. For ASSERT, the financial/key data of about four million[2] private EU companies referring to the period 1994 to 2007 was extracted from AMADEUS and transferred to a three-tier database,

[1] Reasons for using AMADEUS database see Poppe (2008).

[2] Due to restrictions in the availability of data not all companies included in AMADEUS allowed for further analysis.

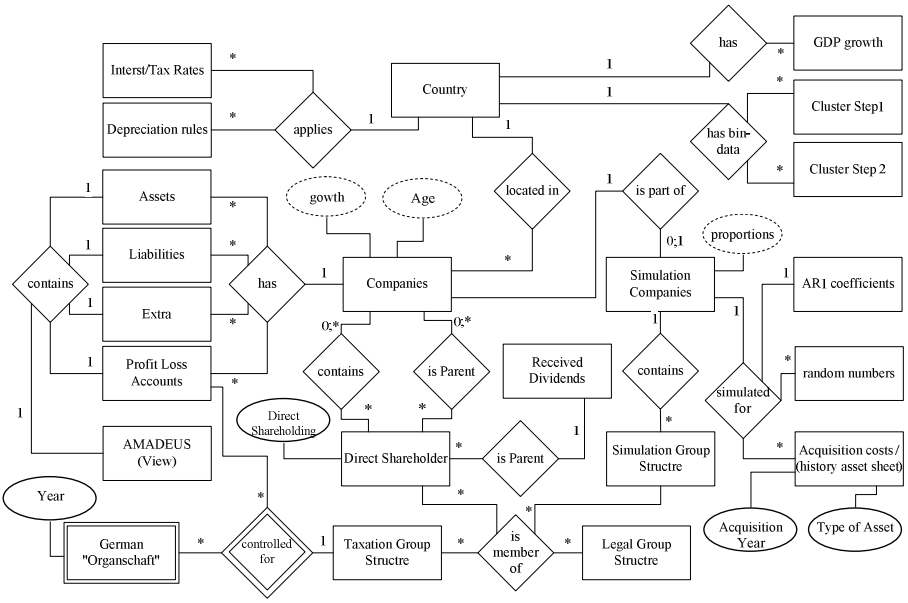

Fig. 1. Illustration of the Dataset Schema

which enables access via SQL, ODBC and JDBC.[3] Similarly, the ownership information and ratios from other sources was extracted, transformed and loaded as well. The final dataset schema is illustrated by an ER model [4] in Fig. 1.

For the purpose of divide and conquer and tax compliance a determination of three different group structures is required. To this end, we derive a legal group structure, a tax group structure and a process group structure by referring (also indirectly) to the root node of the structure similarly to the transitive closure (Fig. 2) [23].

Regardless of the country setting, (direct and indirect) shareholding of more than 50% is required for belonging to a legal group. To establish a tax group, the parent company and the subsidiary have to be located in the same country and a specific minimum percentage of (direct and indirect) shareholding, depending on local tax law (greater than 50%, 75%, 95%, 100%), is required [18,19]. Finally, all companies that are connected via shareholdings are combined to form one simulation group (Fig. 2), missing simulation companies (company "I") are bypassed and a level-information beginning from the leafs is added. Simulation companies are omitted and, thus, classified as missing companies if they do not provide complete financial statements at least in the years 2006 and 2007 or if they are located in a country for which less than 180 datasets (base-data) having three consecutive entire financial statements can be identified.

[3] By courtesy of Bureau van Dijk.

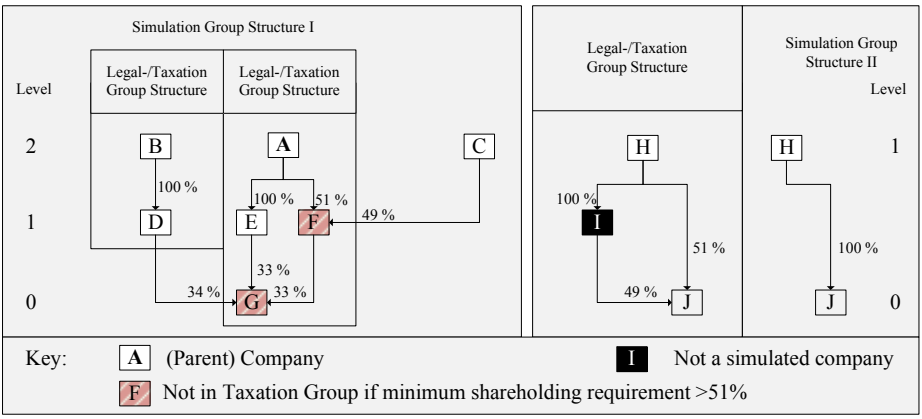

Fig. 2. Legal-/Taxation-/Process- Group Structure

For each country, these datasets (base-data) were clustered in accordance in a first tier with the balance sheet total and in a second tier in accordance with return on assets in a way that each cluster contains approximately the same number of datasets. This procedure results in a number of distinct company bins. Datasets with extreme values in return on assets are excluded. Finally, the mean and median of the bucket attributes are calculated. These values form the basis for simulating future company development (see Section 3.3 for further details).

AMADEUS, however, provides information with regard to the aggregated book values of intangible tangible fixed assets as well as total depreciation. In order to derive an asset history sheet, we indentified the OSIRIS database (also provided by Bureau van Dijk) as the best possible source of additional information on the type of assets. To create an initial asset type structure, we determined country and industry specific ratio from OSIRIS, whereas the initial age structure of assets is derived based on a simple aging algorithm. To this end, the company is accompanied by the purchase of a set of assets, which is replaced in accordance with the amount of economic depreciation (independent from country settings) whereas capital-widening investments are assumed to be realized equivalent to a company-specific average growth factor. After combining these initial asset type and age structures, a simulated amount of depreciation is derived and compared with the actual depreciation as reported in AMADEUS, which represents a benchmark for the simulation routine. To approximate the actual depreciations, an iterative numerical algorithm (maximum 10,000 iterations) was developed. Since we have two dimensions, we adjust both the asset type structure by shifting the proportions as well as the age structure by shifting to newer or older acquisition dates in each iteration [19]. The determination of the asset history sheet is illustrated by Fig. 3.

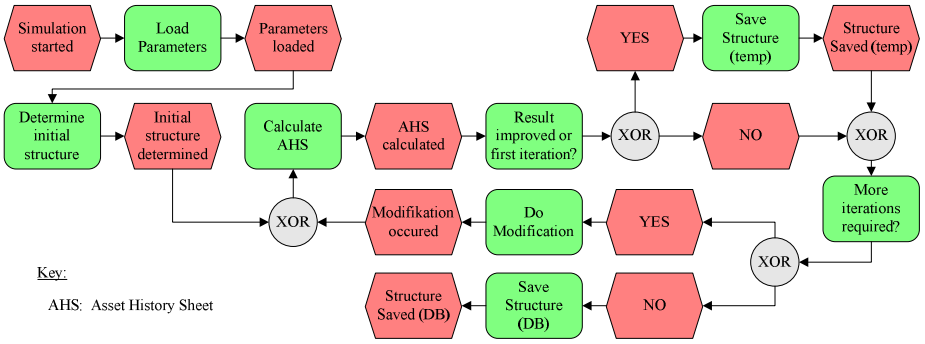

Fig. 3. Visualization of determine asset history sheet

3.3 IT-Artifact Instantiation

The dataset generation and the tax revenue model described in the previous sections are realized by a number of IT-Artifact Instantiations.

The routines creating the detailed asset and financial information is carried out in JAVA. All needed country settings and company information are loaded from the database via JDBC and are organized in country and company objects. For accessing the data getter-methods are used. In order to reuse code-fragments and to alleviate verification of the results for each main calculation step, a sub-procedure is created. Information that is taken out of our database is processed by SQL functions. External analysis is done in STATA. The required data as well as the results are transmitted via ODBC. For clustering the data, Oracle's NTILE function is used.

Whereas the first stage of development of the tax revenue model for the simulation years (implementation) was driven by a process view, we set up an integrated system which is implemented in JAVA. To this end, we define a company object, which represents all company attributes (historical as well as simulated characteristics) as the centre of the artifact (Fig. 4).

Depending on the number of companies to be simulated, which is determined by the respective research question, the simulation process might be partitioned according to the simulation group structure. After having imported the country settings and companies' initial attributes, the forecasting is carried out in the Simulation class. To this end, the following items are forecasted: return on assets and thus EBITDA, extraordinary income, sales, operating revenue turnover, employees and costs of employees, depreciation and amortization, investments, current assets, other fixed assets (financial assets), financial revenue and at the end EBT (earnings before taxes). The forecast of these items follows, if not otherwise stated, the bin-approach. This simulation procedure refers to the development of similar companies (see Section 3.2 for the determination of the bins of similar companies) and generally follows equations (3) and (4).

$$\widehat{attribute}_t = attribute_{t-1} * (1 + attribute_{bin}) \quad (3)$$

$$attribute_{bin} = Median\left(\frac{attribute_t}{\frac{attribute_t + attribute_{t-1}}{2}}\right) \quad (4)$$

More specifically, the forecast of the return on assets is realized by a Monte-Carlo simulation and follows the bin-approach exclusively only if the companies' development is not sensitive to the GDP growth. In all other cases, the bin-approach is combined with an AR1 approach which relies on company individual coefficients.

The forecast of extraordinary income applies two distinct steps. Firstly, a uniformly distributed random variable, corresponding to the companies' past, points to whether an extraordinary income is to be simulated or whether extraordinary income is zero. The second step determines, if necessary, the amount of extraordinary income by way of a Monte-Carlo simulation based on the bin-approach. Other company attributes (sales, operating revenue turnover, employees, costs of employees and investments) are forecasted by the bin-approach. Where applicable, investments are simulated in consideration of a GDP growth modification. After depreciation and amortization expenses have been calculated by applying national depreciation rules to the derived asset history sheet, we assign the simulated investments (positive and negative) to each asset to get an updated asset history sheet as well as a forecast for the value of non-financial assets. Other fixed assets and current assets are assumed to grow in accordance with a general company-specific growth factor. Financial revenue is derived from other fixed assets by applying the company specific interest rate which is modified in some cases by a necessary add-on. At the end of the forecasting process we calculate the EBT by summing up the simulated earnings (simulated return on assets multiplied by mean-year's assets), interest and (to avoid a circular reference) previous year's dividends. This module is, with the exception of depreciation and amortization, independent from national tax law.

Tax provisions (step three) are incorporated in the following modules: Firstly, we reduce EBT with the amount of tax exempt (received) dividends, which are treated in accordance with the parent countries' tax law, under consideration of the direct percentage of shareholding and the location of the distributing company (home versus foreign country). The current version of ASSERT implements the exemption rules and the subtraction routine in country specific sub-classes. The procedures for alternative group taxation systems are located in the Group Taxation class and are executed after the dividend exemption. If negative income persists also after group taxation, losses are offset across periods according to local tax law before companies' tax liabilities are calculated. While local loss-offset rules are completely held available in subclasses, the logic is implemented for most of the countries in the upper-class. Only for Austria and Poland the logic is implemented in country sub-classes since in theses countries differing provisions are applicable.

In the last step of the annual simulation, we determine beginning from leafs of the simulation structure iteratively the appropriation of net income (taking account of received dividends from previous iterations) by calculating the distributed dividends as well as the liabilities and shareholders' equity.

In order to make a point to tax reform proposals, we estimate governments' tax revenue by extrapolating the companies' tax by comparing the simulation sample to

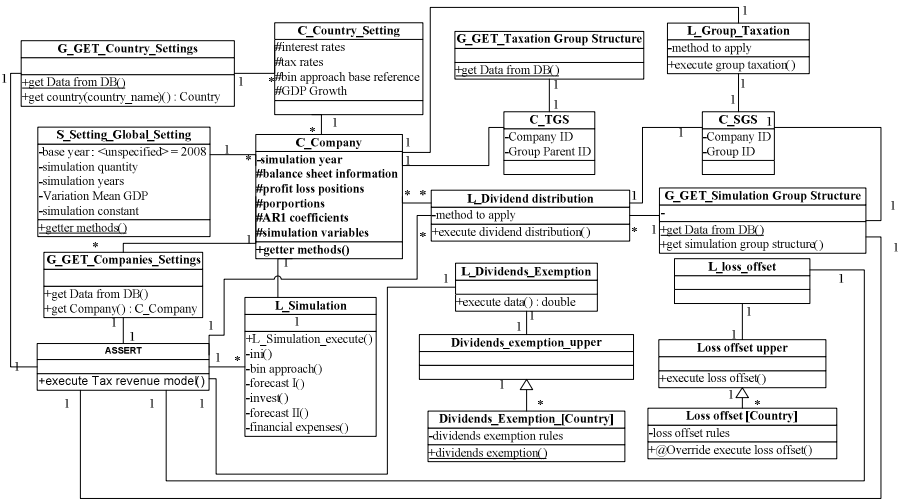

Fig. 4. Illustration of the ASSERT model in UML

the overall population. Companies having negative income are underrepresented in the AMADEUS database compared to the corporate tax statistic. The extrapolation is therefore processed separately for profitable and loss-making companies.

4 Artifact Evaluation

For the purpose of usefully support decisions, correctness, completeness and reliability are essential preconditions for the basis of assessment. These required characteristics are for ASSERT proven by way of an evaluation guided by Sargent's paradigm both with respect to the overall model and each sub model.

For all elements of data a consistency check was performed. Detailed information on the conditions and number of adaptations are reported in [19]. The validity of the constructed group structures was ascertained by test structures and by way of a case-by-case review.

For the implementation of the asset history sheet, the business needs were transferred to hierarchically structured, event-driven Process Chains (ECP) (overall layer see Fig. 2), which were also used in combination with code-reviewing for verification. During the implementation, all interim stages were observed and the procedure was audited by output statements. Finally, the results were audited in terms of mathematical and logical correctness in accordance with equations (5) and (6).

$$Book\ value_{Dataset} = \sum_{Asset\ Type} \sum_{t} Historical\ acquisition\ costs_t * ratio_t \quad (5)$$

$$Depreciation_{Dataset} = \sum_{AssetType} Depreciation_{simulated} \quad (6)$$

Secondly, we evaluated the accurateness by comparing the simulated book value structure to a survey provided by the German Central Bank (GCB). It becomes

apparent that the simulated structure for tangible fixed assets provides a good approximation of the structures reported by the GCB, whereas the applied routine tends to overweigh goodwill with regard to the structure of intangibles.[4] Finally, we compare depreciation expenses simulated for future years (2008 to 2010) with those actually realized and find a high correlation (more than 90 %).

Also each part of the Tax Revenue Model has been evaluated in separated steps. Essential for the performance of the forecast is that the mapping to relevant bucket is processed as fast as possible. For this purpose the Binary Search Algorithm is implemented. As the requested key is continuous, the company's attribute is allocated to the bin for which the difference between the requested key (company's attribute) and the bin's key is minimal. We added output statements for verifying which path is chosen in order to test for the performance and the correctness of the applied mechanism. Based on the mapping, the companies' forecasted attributes were checked for plausibility. In the first implementation we mapped the requested key by reference to a responding range from minimum to maximum value in the buckets and it was conspicuous that the mapping tend to extreme buckets with the result that the mapping refers now to the median of the bucket values. The correctness has been demonstrated in connection with realized attributes for the period 2008 to 2010. In this respect, we noticed that the effect of forecasted return on assets was overestimated if the bins' return on assets is close to zero. To avoid this error, we adjusted the models and applied an additive forecast of companies' return on assets in that case. By performing white-box tests for extraordinary income forecasted in accordance with a preliminary approach, we noticed that in some cases a value different from zero was predicted although companies' extraordinary income in the past was constantly zero. To avoid this inconsistency, we updated the Conceptual and Computerized models and set up the two-tiered process described in Section 3.3.

For all tax provisions the implementation has been checked for correctness and results-oriented tests have been accomplished. To give an example, in countries where a group taxation system is applied, taxation is based on totaled profits and losses within the tax group. Application of the group tax regime has to ensure that the sum of taxable income remains unchanged while the amounts of both positive and negative taxable income decreases. The fulfillment of these two conditions has been audited as a result-oriented test. In addition, the correctness of the applied procedure has also been checked manually for a random sample of companies.

With regard to the offset of profits and losses over time, the offset procedure (offset limitation and provision changes in time) was tested by way of a case-by-case review. In addition, the sum of the taxable income needs to decrease if losses are offset, whereas the loss carry-forward needs to increase by the same amount. Negative taxable income is permitted only in the case of a carry-back option. Also these conditions were audited by way of a result-oriented test.

[4] Since $\frac{Intangible\ Fixed\ Assets}{Total\ Asset} = 2\%$ in average, we proceed on the assumption that the effect is minimal.

Finally, for Germany a black-box validation of the overall model was processed within the scope of a research project. It was shown that the simulated tax revenue are close by the real German tax revenue [18].

5 Conclusion and Outlook

The aim of this paper was to present the innovative micro-simulation model ASSERT. According to the Design Science Research Guidelines, we created an artifact in form of a model and an instantiation. The goal of ASSERT, to evaluate the implications of various tax reforms within the EU, was achieved by assessing the effects of an alternative group taxation system in Germany [18]. The strength of this approach is the consideration of changes in the environmental conditions by using a forecasting algorithm. Also cross-border relationships between corporations are considered. The development of ASSERT is based on an iterative solution search process by creating the Conceptual Model and Computerized Model which was permanently evaluated. Since we use individual company data in an aggregated form, we generated more detailed data for the specific purposes of ASSERT by means of assumptions derived from business principles. Starting from a functional implementation by applying the forecast mechanism and the current tax provisions process wise, nowadays the focus is on the company. Therefore we set up an object oriented construct whereby all companies' attributes are available for access at any time.

For the future, an extension of ASSERT is intended. The analysis at the moment is limited to assessing effects of direct consequences resulting from changes in the tax regime (first round effects). Companies' behavioral adoptions (second round effects) are planned as well as a more detailed consideration of special country taxation rules as for instance the German Thin Capitalization Rule.

Acknowledgements. The micro-simulation model has been developed by Andreas Oestreicher, Reinald Koch, Dorothea Vorndamme and Stefan Hohls, Georg-August-Universität Göttingen. I would like to say 'thank you' to the project team for the productive work and the crazy time as well as to Jan Muntermann who gave valuable words of advice.

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Participation in Discussion Spaces of Health Informatics in Brazil

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Abstract. This work analyses instances of discussion related to the Brazilian public policy on health information and communication technologies (ICT). Departing from a theoretical model, which relates health ICT outcomes to instances of discussion, this work aims to identify how multiple actors participate on decision-making processes regarding health ICT. Laws and norms related to discussion forums about Brazilian health system were researched. The work shows that the discourse of participation has been present since SUS (Brazilian Unified Health System) beginnings, and, in recent years, new forums have been created. Thus, this paper concludes with the importance of a coordinated work between the forums, as well as the very need of participation of multiple actors in the instances of discussions about health ICT.

Keywords: Health Information Systems, Public Policy, Informatics in Brazil's Health System.

1 Introduction

Over the last twenty years, countries have bet on national strategies to incorporate information and communication technologies (ICT) into health practices [1-5] and scientific literature about Health Information Systems (HIS) reports that the informatization of health is a long-term process influenced by diverse actors [1, 6-8].

This is also the case in Brazil, where the first HIS emerged in the 1970s [9] and, after three decades, diverse advances have taken place in an effort to develop ICT for the benefit of health. In Brazil, the HIS were developed by actors in both public and private sectors to meet the demands of health planning and management, as was the elaboration of a national strategic vision of heath informatics [4]. However, recent attempts by the Ministry of Health (MoH) aiming to construct an Electronic Health Record (EHR) on a national level failed and the HIS produced in Brazil are fragmented, limiting the use of the information for the benefit of the Brazilian population [8].

Considering the complex scenario related to the informatization of health in the Brazilian setting, it becomes necessary to study the factors associated with this process. Therefore, based upon the premise that participative actions can bring about better results for health ICTs, this work seeks to analyze the participation of diverse actors involved in the instances of discussions of health informatics in Brazil.

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 123–134, 2013.

To do so, this work articulates three theoretical perspectives – Health Information Systems Project [6-7, 10], Information and Information Technology in Health [8-9, 11], and Development Studies [12] – in order to formulate an analytical model that relates instances and actors involved in the discussion of health informatics in Brazil. Therefore, national instances of discussion about health ICTs are identified, as are the actors who have participated in such instances.

This work is organized in the following manner: After the introduction, section 2 reviews literature associated with the three theoretical perspectives cited and presents the analytical model for the analysis of participation in instances of discussion on health informatics. Section 3 discusses the methodological procedures adopted in the study. Section 4 presents the results accrued from the analysis of the chronological trajectory of health informatics in Brazil, from the 1990s onwards, and section 5 discusses the results found. Finally, in section 6, the work's conclusions are presented.

2 Literature Review

Since the 1990s, diverse countries have sought to explore the possibilities associated with health ICTs through national projects and strategies. Among such one can quote Canada [1], Australia [2] and England [3] and more recently the United States [5]. Such initiatives have generally been conducted by independent entities that support local actions aiming to develop HIS, while, on a national level, they seek to link governmental actors and civil society, in order to construct agreements and define patterns to integrating local systems.

Research shows that the social participation in discussion processes and implementation of health ICT can be a critical factor for the success of these projects. As such, in the following paragraphs three theoretical perspectives that study participatory processes will be presented: Health Information Systems Project [6-7, 10], Information and Information Technology in Health [8-9, 11] and Development Studies [12].

In the context of studies about ICT in developing countries, the Health Information Systems Project (HISP) [6-7, 10], observing the necessity to develop HIS in a sustainable and scalable manner [6-7], argues about the importance of establishing networks of action that make feasible the implementation of HIS [6, 10].

The networks of action [6 p. 342] are defined as "intended to capture the dynamics of translating, aligning heterogeneous networks of routines, technology, and learning within politically contested terrains of opposing projects and ideologies, in an effort to promote sustainable, replicable changes". This network of heterogeneous actors is mobilized to support the system, as well as promote the sustainability of HIS [6-7], scalability [6], technical capabilities, and learning [10]. The actors of networks of action include politicians, bureaucrats, representatives of international organizations, researchers, and technical artifacts, i.e. infrastructure, HIS and other technological resources. Therefore, strategies are needed to design flexible and participatory activities that bring together the different interests, with a view toward mobilizing support for HIS [6].

In Brazil, within the context of the Brazilian Sanitary Movement [8-9, 11], studies have argued how participative actions can enable the development of ICT, aiming at attending the interests of Brazilian society. For instance, Moraes and Vasconcellos [11 p. 97] put the challenge to "expand the use of information in the daily decision making of health, either in policy, management, surveillance, clinic or social control, facing unequal access to the benefits of technological advancement". Thus, they proposed a way to build a national pact around the theme of health informatics, suggesting the convening of a National Conference on Information and Information Technology in Health.

Moreover, Moraes and Gomez [8] proposed the construction of a political-epistemological interfield encapsulating the production of information in health practices, from assistance to planning and management. In the words of the authors "an 'information and information technology 'interfield', in order to put forth a manifesto that considers actors, practices, procedures and knowledge that crosses over as well as penetrates other 'fields', have already constituted differentiated criteria of identity and value within common health references" [8 p. 560].

The information and information technology interfield accrued from the Brazilian Sanitary Movement integrates HIS, from assistance to planning and management. This interfield is composed of the entirety of information related to health, namely administrative, financial, and assistance, in both the domain of public and private health. Or in other words, information that is widely used, from clinical practice – in professional/patient relations – to planning and management actions [8].

Based on the concept of the information and information technology interfield, Moraes and Gomez [8] illustrate some spaces for discussion of the production of health information. These areas involve public and private actors, comprising: (a) the ways of life in health, regarding civil society; (b) the government, covering instances of integrative health information; (c) economic undertakings, encompassing the producers of goods and services of ICT; and (d) science and technology, including education and research in informatics in health. The spaces would be related and, through them, informational praxis in health would be discussed [8].

Finally, within the context of Development Studies, Evans [12] observes the frustrating results of the institutional monoculture, which as he explains, "try(ing) to impose uniform institutional blueprints on the countries of the South - what I call "institutional monocropping" - has produced disappointing results" [12 p. 20]. Therefore, the author proposes for the amplification of the notion of development to go beyond economic growth and, based in the thinking of Amartya Sen, defends the organizational move in which "'deliberative democracy' offers a more substantial institutionalization of 'public discussion and exchange'" [12 p. 22].

Thus, Evans [12 p. 22] argues that, "institutions indeed appear to be effective in engaging the energies of ordinary citizens in the process of social choice', in that they "appear to increase citizenry's willingness to invest in public goods and to enhance the delivery of these goods".

Therefore, based on the contributions of the three perspectives cited above, this work defines an analytical model for analysis of participation in the instances of

discussion on health informatics (Figure 1), composed by instances of discussion and actors.

The instances of discussion are defined as spaces in which actors discuss and deliberate questions related to health ICT. Therefore, they influence the development of material elements of health informatics, which are: HIS, patterns of interoperability and norms, such as the allocation of resources, finances, technologies and people. This definition is based on the concept of networks of action [6], interfield spaces of information and information technology in health [8], and deliberative institutions [12].

The actors are defined as representatives of diverse segments involved in health ICT. According to the three perspectives [6, 8, 12], such actors are comprised of politicians, bureaucrats, businesses, social movements, international organisms, science and technology organizations, and class associations, among others. Based on Moraes and Gomez [8], the actors are classified in accordance with four categories: government, businesses, science and technology and civil society.

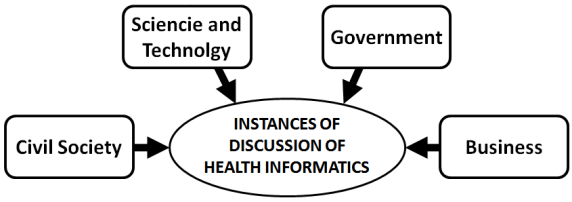

Fig. 1. Analytical model of participation in instances of discussion on health informatics

Stemming from the theoretical concepts proposed and based upon the premise that participative institutions can generate better results for public policies on health ICT in Brazil, this work seeks to identify how instances of discussion were instituted throughout the last twenty years, how they came about, which objectives they hold and which actors have participated in these instances.

Thus, the objective of this paper is to understand how instances of discussion on health informatics are promoting social participation in the formation and implementation of public policies in health informatics in Brazil.

3 Method

This study, aiming to analyze the instances of discussion related to health informatics, is based upon a qualitative approach supported by documental analysis. For such, as shown in Table 1, information about legislations and norms related to the Brazilian health system have been collected, more specifically regarding health informatics, from the 1980s onwards. It was also surveyed news and reports about actions related to the informatization of health in Brazil.

The analysis of the data is based upon the analytical model proposed in section 2. Thus, actors and instances of discussion related to health information policies were analyzed via this aforementioned model.

Table 1. Laws and norms associated with the institutionalization of health informatics in Brazil

Law/Norm	Description
Federal Constitution of 1988 [13]	Assures health as a social right and government obligation.
Law 8080/1990 [14]	Organic Law of Health.
Law 8142/1990 [15]	Institutes participation at SUS.
Decree 100/1991 [16]	Creates Datasus.
Ordinance MoH 01/1996 [17]	Creates CIB and CIT.
Resolution CNS 227/1998 [18]	Creates CICIS at CNS.
Law 9782/1999 [19]	Creates Anvisa.
Law 9961/2000 [20]	Creates ANS.
Ordinance MoH 1919/2002 [21]	Creates RIPSA.
Resolution CNS 349/2005 [22]	Reformulates CICIS.
Ordinance ANS 19/2006 [23]	Creates COPISS at ANS.
Ordinance MoH 349/2009 [24]	Creates CIINFO/MoH.
Ordinance MoH 2072/2011 [25]	Reformulates CIINFO/MoH.
Ordinance MoH 2073/2011 [26]	Regulates standards for information sharing at SUS.

The instances of discussion were identified as the spaces established in the legislation. During their analysis, one attempted to identify the goal set for each instance, and the period in which the instances were created (and, in some cases, altered). The actors include institutional participants in the instances of discussion, namely government, business, science and technology institutions, and civil society.

The following section presents a historical trajectory of health informatics in Brazil, showing its main events. Then, discussion section sought to identify how the objectives of instances of discussion complement each other or overlap. Furthermore, one attempted to analyze how the different categories of actors were present in each instance of discussion.

4 Health ICT in Brazil

In Brazil, the first HIS appeared in the 1970s in the welfare health system in effect at the time, and in the 1980s HIS were developed to control the billing submitted by health providers accredited by the National Institute of Social Security (INAMPS) [9].

In the 1980s, the Sanitary Movement, in order to challenge the prevailing model at the time, championed a political campaign for the universal right to health. This campaign was called the Brazilian Sanitary Reform, which culminated with the institution of the Unified Health System (SUS), the current base of the Brazilian health system [27].

The Brazilian health system, SUS, encompasses the universal right to health, public financing, administrative decentralization, and community participation. These fundaments have been achieved at Federal Constitution of 1988 [13], Law 8080 of 1990 [14], and Law 8142, also of 1990 [15]. Due to that, national, state and municipal councils on health were created, representing the instances of social participation in the discussions on the Brazilian health system [15], such as the Intergovernmental Commissions Tripartite (CIT) and the Intergovernmental Commissions Bipartite (CIB), which comprise the instances of interfederative pacts with the SUS [17].

Along with the SUS, the National Health Information System (NHIS) was established, whose organization fell to the Ministry of Health (MoH), in partnership with states and municipalities. To account for this attribute, in 1990 the IT Department of SUS (Datasus) was created [16]. The decentralized management, a basic tenet of the SUS, oriented actions aiming to provide HIS at regional and local levels. As such, Datasus began to produce HIS to support the actions of state and municipal health secretariats.

Considering the range of existing HIS in Brazil and the necessity to homogenize information, the MoH, at the end of the 1990s, launched the National Health Card project [11, 28-29]. This project aimed to create a national registry of citizens, and as such, aggregate the information present in various HIS used in Brazil, providing a platform to channel informatics around the EHR. However, few results have been effectively reached to date [28].

In the 2000s, regulatory agencies in the health arena were established: the National Regulatory Agency for Private Health Insurance and Plans (ANS) [20] and the Brazilian Health Surveillance Agency (Anvisa) [19]. The ANS introduced new governance in the management of supplementary health, regulating operating activities and private health service providers. Anvisa had already come to act within the National Health Surveillance System, regulating the commercialization of products and services subject to sanitary vigilance. Thus, agencies came to command informatics activities within their areas of expertise.

Still in the 2000s, the first mobilizations pursuing a more holistic view of health information began. These mobilizations culminated in 2004 with the publication of the National Policy on Information and Information Technology in Health (PNIIS) in the 12th National Health Conference [4]. The PNIIS, while being a trademark, became an important referential in the development of health informatics in Brazil, as it defined the national strategic vision. Thus, guidelines and actions designed and established responsibilities to government actors and civil society. However, since the publication of PNIIS, very little of its propositions have actually been implemented.

In 2002, the Inter-Agency Health Information Network (RIPSA) was created with the objective of consolidating the generation of health information, as agreed with the Pan American Health Organization (PAHO) [21]. During this period, the National Council of Health (CNS) also reformed the Intersectoral Commission of Health Communication and Information (CICIS), established in 1998 [18], which aims to assist the CNS in subjects seeking the democratization of communication and information [22].

Meanwhile, in 2004, ANS established the pattern of Private Health Insurance Plans and Information Exchange Standard (TISS), which allowed electronic information exchanges between providers and operators in private health. Aiming to continue to TISS and other actions in the private health, in 2006, ANS established the Private Health Insurance Plans and Information Standardization Committee (COPISS), in order to promote the development of electronic information exchange in private health [23].

Alongside the activities of the MoH, the Brazilian Society of Health ICT (SBIS), in conjunction with the Federal Council of Medicine (CFM), has developed a certification process for EHR. This process, also known as electronic signature, became a significant milestone in health ICT, as it established the legal foundation for the full adoption of computerized clinical record as a substitute to paper.

More recently, in 2009, the MoH established the Health Information and Information Technology Committee (CIINFO/MoH) with regulatory functions, policies and oversight of the activities of health informatics within the SUS [25]. In 2011, the MoH, based on the determination of the CIINFO, regulated standards for interoperability of health information [26]. This discussion did not count on the participation of other actors of civil society, who strongly criticized the actions of the MoH [30].

In parallel, fragmented HIS continued to be developed. The MoH, itself, currently owns around 60 information systems, which support various administrative functions, assistance and statistics [31] , while states and municipalities use more than 700 HIS [28]. Furthermore, in the supplementary health sector, HIS have been developed aiming at an efficient management of inventories and costs.

From the scenario presented, the next section unveils the actors and instances of discussion of health informatics in Brazil, arguing some implications accrued from these instances in the outcomes of health informatics in Brazil.

5 Discussion

Participation is present in the discourse of health information in Brazil since the rise of the SUS, as the Brazilian constitution assures society's participation in actions related to health [13]. Likewise, social participation is assured in instances of health planning and management, as is the case of national, state and municipal councils on health [15].

In the case of health informatics, some instances of participation have their thematic spaces, such as the CICIS within the CNS [18, 22], the COPISS within the ANS [23], and CIINFO within MoH . The text of PNIIS also reinforces the importance of participatory activities for the determination of actions on health informatics [4].

Although the participatory instances have existed since the beginning of the SUS, in recent years there is increasing discussion of instances of health informatics, as was the case with RIPSA [21], COPISS [23] and CIINFO [24, 30]. These instances reflect the complexity of the Brazilian health system, which receives public and private financing, as well as the participation of both public and private health service providers.

The complexity of the health informatics scenario is evidenced by the wide range of state actors and civil society organizations present in the discussion of public policy related to the area. In public health, there are SUS managers – MoH, state health departments and local health departments – public providers of health services and social control agencies, such as the CNS, state boards and municipal councils health. In supplementary health, ANS, health insurance companies and private providers are present. There are also actors who are part of both the public and supplementary health system, namely: the citizenry, philanthropic providers, associations, institutions of science and technology, and service providers of healthcare information technology.

These actors have debated health informatics in various stages of discussion, as presented in Table 2. As it can be seen, it was found via consultation with the current legislation four instances of discussion about health informatics without a single coordination or assignment of tasks, which can create conflicts that might affect the advancement of health informatics public policy in Brazil.

Table 2. Instances of discussion of health informatics

Instance of Discussion	Year	Description
CICIS	1998	Support CNS in questions regarding information and information technology in health.
RIPSA	2002	Improve usage of information in health.
COPISS	2006	Promote development and improvement of information exchange in private health.
CIINFO	2009	Normative, regulatory and supervisory functions of health ICT in the SUS.

As for the actors present in this discussion, CICIS is represented by members of government and civil society; RIPSA includes actors within the MoH and technical-scientific institutions, the COPISS comprises a wide range of government and civil society, and finally the CIINFO considers organs of the MoH, Ministry of Planning, RIPSA and ABNT. As shown in Table 3, the actors from government, civil society, business and science & technology are present to a greater or lesser degree, in various instances of discussion.

The COPISS consists of various actors in society. Although it has an over representation of civil society and an under-representation of businesses, COPISS is constituted in a plural forum involving various actors of supplementary health in its principal context of discussion.

However, some instances contain mostly government officials, as the CIINFO, which consists mainly of actors from government itself. Moreover, it can still be observed in some instances, as CICIS and COPISS, that important government actors, although having a seat, have not indicated representatives yet. Finally, the low level of participation of businesses in instances of discussion is also noted.

Table 3. Number of actors present in instances of discussion

Instance of Discussion	Government	Civil Society	Science and Technology	Business
RIPSA	7	-	1	-
CIINFO	12	1	2	-
CICIS	3	12	1	-
COPISS	3	16	1	2

The asymmetries of participation can influence the participatory debate on the formulation and implementation of health informatics public policy in Brazil. According to Evans [12], institutions with social participation increase the likelihood of generating public goods and societal engagement in public policy. Likewise, Moraes and Gomez [8] proposes the reconstruction of an interfield of information and informatics in health, involving various segments of society. Thus, Braa et al. [6] advocate the construction of networks of action involving diverse community actors in the implementation of HIS. It is necessary that the government and civil society actors are represented in the various spheres of discussion, in order to build intertemporal agreements that lead to the development of information technology in this field.

Actions without the broad participation of society can lead to conflicts, as is the case of the ordinance that regulates the exchange of information between information systems used in the public and private spheres [26]. Such regulation has suffered various criticisms for not considering the interests of civil society [30].

On the other hand, the case of ANS represents a breakthrough in discussions with government and civil society. The agency has developed TISS and TUSS standards allowing the automation of transactions between health providers and health operators, increasing the adoption of ICT for private health.

Finally, other actors, even without much government involvement, have developed actions. An example is the digital certification standard for EHR, prepared by SBIS in conjunction with CFM, without the participation of MoH. Thus, one observes that actions, even without the direct participation of government representatives, set standards in health ICT that ended up being used all over the country.

6 Concluding Remarks

Health ICTs have been part of the Brazilian scenario since the 1970s, but today they still have not been able to transform health practices in the country. While there have been advances in the area, limitations in the effective use of informatics within health practices in Brazil still exist.

Recent failures in the construction of EHR reveal instances in which the process of health informatization will not take place by itself. Rather, a discussion that includes the government, businesses and civil society becomes necessary, aiming to develop health informatics toward the benefit of Brazilian society.

Participation is present in the discourse of health information since the surge of the SUS but in recent years an increase in instances of discussion has been observed. These new instances reflect the intention of actors to create spaces to influence health informatization. It is important that these instances possess particular coordination and attributions, in order to avoid conflicts in the standardization and definitions produced in each space.

It is also important that the instances of discussion have representation from diverse actors from both the government and civil society, thus producing agreements that engage all participants in the construction of public goods that convey to the development of health informatics.

This study focused on the Brazilian scenario, not analyzing local or regional experiences. Future research may be based on the proposed theoretical framework to analyze other instances of discussion.

Furthermore, the categories employed in this study can also limit the understanding of the complexity of actors involved in the discussion of health informatics in Brazil. For example, Brazilian civil society is not homogeneous, representing diverse and quite often divergent interests. Thus, more studies become necessary in order to better understand the interests present within Brazilian health informatics.

The enlargement of theoretical backgrounds is a highly argued topic within studies about ICT in developing countries. Avgerou [32] observes that, "we need studies of the political actors and institutions through which economic models and technological potential are translated into industries, information infrastructures and 'empowered' societies". This work points in that direction, toward the proposal of an integration of three theoretical perspectives for better understanding the HIS in Brazil.

Finally, it is expected that the perspective proposed in this work enable the development of further studies that seek to assess the quality of public policies, norms and definitions produced in instances of discussion, as well as the social participation that these instances provide.

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Glossary

ANS	National Regulatory Agency for Private Health Insurance and Plans
Anvisa	Brazilian Health Surveillance Agency
CFM	Federal Council of Medicine
CIB	Intergovernmental Commissions Bipartite
CICIS	Intersectorial Commission of Health Communication and Information
CIINFO	Information and Information Technology in Health Committee
CIT	Intergovernmental Commission Tripartite
CNS	National Council of Health
COPISS	Private Health Insurance and Plans Information Standardization Committee
Datasus	IT Department of SUS
HER	Electronic Health Record
HIS	Health Information Systems
ICT	Information and Communication Technologies
MoH	Ministry of Heath
PAHO	Pan–American Health Organization
PNIIS	National Policy on Information and Information Technology in Health
RIPSA	Inter–Agency Health Information Network
SBIS	Brazilian Society of Health ICT
SNIS	National Health Information System
SNVS	National Health Surveillance System
SUS	Unified Health System
TISS	Private Health Insurance and Plans Information Exchange Standard

Government Architecture: Concepts, Use and Impact

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Abstract. Government architecture (GA) is a relatively young discipline in which concepts are slowly emerging. Often terms and concepts are used in various ways and there is no uniform agreement on these concepts. Further, the relationship between GA, benefits and public value creation is unclear. In this paper we unravel and define GA concepts that are often used by governments. Although GA is used in different ways there are common concepts. GA practice in two different countries, the Netherlands and Norway, indicates that although the Netherlands clearly has more experience with GA than Norway, both countries employ similar concepts. Nevertheless our study confirmed the assumption of conceptual confusion. In both countries GA efforts are concentrated towards guiding design projects and dealing with complexity. We found that the impact of GA is ill understood. We defined central concepts of GA, and propose a conceptual model illustrating the relationships between GA concepts, its use, benefits and public value drivers.

Keywords: Enterprise architecture, design, design science governance, government, government architecture, public value.

1 Introduction

Current developments within the government sector focus on issues like access to open data, shared services, cloud computing and data integration between private and public organizations increase the importance of government architecture (GA). Government from across the world have embraced the concept of GA [1-3] which is often inspired by information systems architecture [4], information architecture [5] or Enterprise Architecture (EA) [3, 6]. The term 'information systems' refers to the various socio-technical elements, 'information' refers to information as a fourth production factor, whereas "enterprise" refers to the scope of the architecture dealing with multiple departments and organizations rather than with a certain organizational part or individual components and/or projects [8]. In government various terms are used including enterprise architecture [3], or national enterprise architecture [7] or national or domain reference architecture [9]. We prefer to avoid the word enterprise to avoid

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 135–147, 2013.

any association with business, and prefer the wording government architecture to refer to the scope of the government in contrast to the enterprise.

Governments have adopted a variety of models and often developed their own customized frameworks and applications that fit their country or organizational situations best, resulting in a variety of GAs [7]. Over time, these GAs developed in their own directions and adopting their own vocabularies may result in conceptual unclearness and indistinct concepts [7]. There is no "one-size-fits-all" architectural method that is equally effective and a contingency approach is often taken [10]. Much can be learned from each other, but learning is made difficult by the various meanings that are given to the same concepts. Having a clear vocabulary is necessary to advance our understanding of the field and to understand how the various research efforts and conceptualizations are related to each other.

The concept of architecture is ambiguous and lacks a common agreed upon definitions [11]. Smolander [12] argues that a plausible reason for why it is difficult to define architecture as a concept is that the source domain i.e. building architecture is equally ill-defined and that the meaning of architecture changes according to the type of stakeholder, situation under study, and the phase of the project. A common understanding and methodological consistency seems far from being developed [13]. There is a body of literature comparing different approaches and frameworks with each other [13-15]. Aier et al. [2008] and Simon et al. [13] provide an overview of EA literature, compare different frameworks and approaches found in the literature along the following criteria: the understanding of enterprise architecture (i.e., the degree of consideration of architectural layers); the representation of enterprise architecture (modelling languages, tool support); and the use of enterprise architecture (e.g., documentation, analysis, and planning).

In general, an architecture is the conceptual description of the set of elements and the relationships between them [16] aimed at creating a coherent and consistent set of relationships among (sub)systems [17]. A commonly used definition is that of the architecture working group as described in the IEEE Std 1471-2000 "Architecture is the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principle guiding its design and evolution" [18]. According to this definition architecture consists of the following elements; architectural principles, implementation guidelines, system structure and components. Architectural principles are the foundation for making necessary design decisions and guide the development. Implementation guidelines focus on how organizations can adopt and implement their own architectures, whereas system structure and components focus on the components of the system and their relationship.

This paper is a first attempt to provide clarity concerning the concepts, use and impact of GAs. EA can be used within a single organization, but in GA needs a scope that goes beyond a single organization and domain. Due to the wide variety or stakeholders, domains and diversity of government the complexity of GA may exceed the complexity of traditional EA. Further, as GA can be described as the backbone of modern public value creation and production it is seen as essential to ensure that GA is developed to leverage public value. We therefore develop a conceptual model

including the central concepts of GA, direct and indirect benefits from GA and public value drivers. This model can be extended and refined in further research.
There is a limited amount of existing conceptual research on GA and there is no uniformity among definitions or GA methodologies. This heterogeneity can be attributed to the abstract and diverse character [13-15]. To get a grip on this, we adopted a combination of deductive and inductive approaches to address our research problem, in line with Simon et al. [13] we will utilize applied research to overcome potential gaps between theoretical foundations and the application of EA management.

We applied inductive reasoning by starting from specific observations in Norway and the Netherlands to broader generalizations and theories, in other words; moving from the specific to the general. We opted for investigating two different situations in which GA are developed and in use, namely the Netherlands and Norway. This allowed us to observe a variety of different conceptualizations of direct and indirect benefits relating to GA. We explored the situation by first analysing publicly available data from both countries, by reading reports, presentations, project documents and websites. Thereafter, our findings were discussed by key personnel working in these GAs projects. Using literature we then sought for patterns and common elements in these observations resulting in our conceptualization. From the usage patterns we derived the main GA components, which are defined based on insights from the literature. Finally a model is developed which shows the contribution how the GA components create value.

The paper is organized as follows. Next, GA usage pattern is derived, resulting in conceptualization of main concepts, which are illustrated by observations from our two countries. Finally we conceptualize relationships between impacts and value of GA before we conclude.

2 Government Architecture Usage Patterns

GA development can be characterized by elements that are used to influence the development of the architectural landscape. GA is intended to direct and help developers in their design activities. Architecture influences the design decisions and the investments of an organization and in turn is influenced by behavior and design decisions. A GA actually emerges as a result of implementing individual projects. As such, architecture and design are closely linked as architecture aims at guiding designers in their design efforts.

Design science, as conceptualized by Simon [20], focuses on creation of artefacts to solve real-world problems. Design science research combines a focus on the IT artefact with a high priority on relevance in the application domain, which is also the intention of GA. Typical GA artefacts include framework, tools, principles, patterns, basic facilities and shared services [9]. These are used to influence new design projects at the conceptual level of implementation level. At the conceptual level the initial architecture of a project is influenced, whereas already available facilities and shared services can be used when implementing the design.

The information systems (IS) community have recognized the importance of design science research to improve the effectiveness and utility of the artefact in the context of solving real-world business problems [21]. Design science research in IS addresses what are considered to be wicked problems [22, 23] that can be characterized by unstable requirements and constraints based on ill-defined environmental contexts, complex interactions among components, inherent flexibility to change design processes as well as design artefacts, a critical dependence upon human cognitive abilities (e.g., creativity) to produce effective solutions, and a critical dependence upon human social abilities (e.g., teamwork) to produce effective solutions. GA is aimed at tackling a broad range of issues as the architecture aims at guiding a variety of design projects ranging from integrated service provisioning to social media platforms. Complexity is at the heart of the architecting challenges. When projects fail, one of the reasons is typically that the system or situation was more complex than originally expected. Many of the architecture methods, models principles, rules, standards and so on are aimed at simplifying the situation.

GA cannot be viewed as a isolated instrument as it needs governance to be effective [e.g. 7]. GA is shaped by the interaction among stakeholders and influenced by contemporary developments. The organizations can adapt their GA strategy according to the path dependencies and anticipated or desired benefits. Whereas the initial focus might be on reducing administrative costs in the Netherlands and interoperability in Norway current developments like cloud computing and open (linked) data influence these developments. This results in expanding GA to be able to deal with new contemporarily challenges.

The GA exhibits emergent phenomena like new standards, technology, innovations and players entering the field and there is no central control or invisible hand. In both countries the GAs are aimed at guiding and directing the development of ICT-projects in the government. This is a generic pattern that provides some commonalities. An important distinction is the use of the project start architecture (PSA) and GA [25]. Whereas GA refers to the government domain or organization as a whole, start architecture refers to the initial architecture developed for a certain project. PSA is derived from the EA and provides guidance for project-level decision-making. GA influences the design decisions and the investment behaviour of an organization and is in turn influenced by behaviour and design decisions. Further, GA influences the design decisions and the system architecture that will be developed by a project.

The usage of architecture is about the balance the use of the architecture in design projects and providing leeway to the designers to deal with the inherent complexity they are working in. Too much freedom results in heterogeneity, whereas too little freedom may result in mechanistic views, reduced creativity, inappropriateness of dealing with uncertainties and solutions that are not appropriate for the given situations. Figure 2 provides an overview of the EA elements (in the box) and how they are used when developing PSA. This framework is created by relating main process step (grey blocks) used in design project to the elements of GA used in each of these steps. When a project is initiated the project requirements will be have to comply with the requirements as posed in the GA, such as the level of security and privacy.

Thereafter, the EA framework will provide the structure for developing the PSA. The PSA will be filled in based on the input provided by EA elements principles, guidelines and standards. Elements that are not filled in have to be complemented by the project. If new elements can be added this might result in an update of the GA and the GA has to be adopted continuously. Also the realization of a new system or the evaluation might result in new insights, which can be fuelled into the GA. Once the process is completed the PSA is finished.

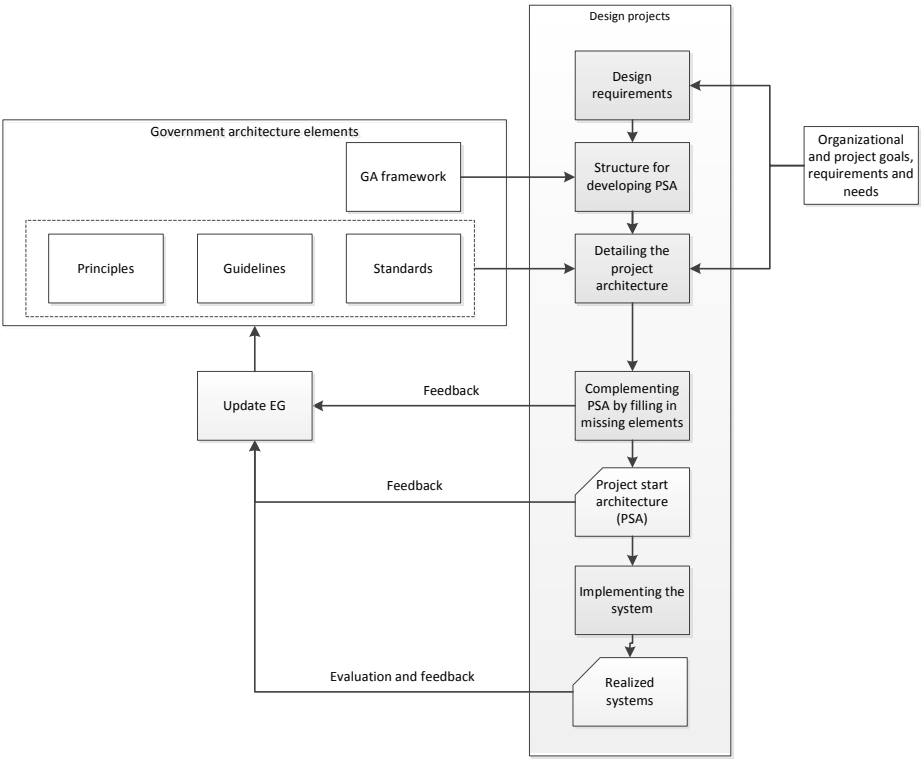

Fig. 1. Common architecture usage patterns

The above usage patterns are based on how GA should be used to guide development projects, although we found that many times this usage pattern was more dynamic and ad-hoc. In a similar vein the GA can be used to guide modification of daily activities. This follows a similar process in which the PSA is updated and guided by the common architecture elements.

Conceptual clarity is needed; hence we will further discuss and define the elements of GA by applying the elements from the framework and discussing practice in the Netherlands and Norway.

The Netherlands was a frontrunner in the field, and in 2004 the Ministry of government reforms initiated the development of a national GA aiming to reduce red tape, whereas at a later stage the emphasis shifted toward interoperability, due to the focus of the EU on interoperability. A second version of was released in 2007 and in 2009 a third version was released, focusing on managers and administrators. Whereas the second version contained a large number of principles this number was reduced in the third version.

Norway has had action plans for ICT in government or eGovernment since the early 2000s. Architecture became part of these plans in 2006, as part of a Government proposition. A central part of the Norwegian architecture is a number of suggested common public ICT components, with the idea that functionality required by the majority of services should be developed once and made publicly available for re-use. Norway lacks an explicit focus on GA at the national level. However, several typical components of GA have been focused upon but the step of organizing it in a GA has not yet been formally initiated.

2.1 Frameworks

Zachman [4] introduced the concept of architecture frameworks that provide multiple views on information systems. Frameworks are used for describing and understanding EA [26]. The frameworks model(s) chosen determine what aspects can be captured at what level of abstraction. In EA the use of frameworks has been given much attention and a variety can be found [1, 14, 27], although many of them cannot be qualified as architecture frameworks. A framework often is realized as a matrix that visualizes the relationship between the various elements in each domain [9].

In the Netherlands GA is developed by adopting one part of the Zachman model. The architecture is driven by requirement for EU, Dutch government, businesses and citizens. The model is primarily used as a way to structure and interrelated architecture principles and best practices. The web-based version contains hyperlinks to these principles and practices. The framework is generic due to the need for covering all public organizations. As the national EA is generic there are a number of domain architectures, which are derived from the NEA and provide more details and are customized to the domain.

In Norway a three level conceptual framework from 2006 is supplemented recently by a proposed set of core national common components, including guidelines for how to use and administrate these common components. In addition, Norway refers to EU and European frameworks.

In summary, the framework is used to specify how information technology is related to the overall business processes and outcomes of organizations, describing relationships among technical, organizational, and institutional components. This view on EA is expressed by providing codified understanding of elements.

Definition: *Architecture Frameworks structures and interrelates architecture elements to allow design of the elements independently and at the same time ensuring coherency among elements.*

2.2 Architectural Principles

The use of architectural principles for designing service systems are commonly used in the design of systems [28, 29]. Principles are particularly useful when it comes to solving ill-structured or 'complex' problems, which cannot be formulated in explicit and quantitative terms, and which cannot be solved by known and feasible computational techniques [20]. Principles are commonly used for guiding stakeholders in the design of complex information systems [28, 29]. Principles are often based on the experiences of the architects, which they have gained during many years of information systems development [e.g., 29]. Similarly, Gibb [30] suggested that principles are the result of engineers reflecting on the experiences gained from previous engineering projects, sometimes combined with professional codes of conduct and practical constrains. Principles have been defined in various ways and they have been used interchangeably with other problem solving notions, including laws, patterns, rules and axioms [31]. The Open Group have defined design principles as "general rules and guidelines, that are intended to be enduring and seldom amended, that inform and support the way in which an organization sets about fulfilling its mission" [32]. The disadvantage of this definition is that it does not make any differentiation with guidelines, which are more indicative and do not have to be followed. Ideally, principles should be unrelated to the specific technology or persons [33]. Principles should emphasize "doing the right thing" but should not prescribe 'how' is should be accomplished. Principles are normative in nature.

In the Netherlands the principles are used to ensure that everybody is guided by the same starting points and adopt the same approaches when developing new systems. This should warrant that requirements like flexibility, interoperability, security and maintenance are met.

Norway has developed seven high level architectural principles as part of government propositions, to guide the design of service systems. Moreover, a number of national common components and core set of registries are re-used to avoid duplicated development and arrange for consistency.

Definition: *Principles are normative and directive statements that guide in decision making when designing new systems.*

2.3 Architectural Guidelines

Guidelines are aimed at supporting architects, commonly shaped as statements or other indications of policy or procedure by which to determine a course of action. Similar to principles they are aimed at transferring the knowledge obtained by experience to others. Whereas principles have to be followed, guidelines do not need to be completely followed and allow for discretion in its interpretation. Furthermore, guidelines might result in the need to make trade-offs, e.g. open access vs. security. Open access might make it more difficult to ensure security and security might prefer restricted access. Guidelines can be viewed as recommended practice (e.g. use of open source software) that allows some discretion or leeway in its interpretation and use (not always open source can provide a suitable solution).

Interestingly, neither of the countries had explicit mentions of requirements in the available material on EA. In the Netherlands, some 'principles' are in fact guidelines, whereas Norway has no explicit guidelines but reference to EU and other nations guidelines.

Definition: *Guidelines are rules of thumb for determining courses of actions allowing leeway in its interpretation.*

2.4 Standards

Standards management is viewed a new direction of EA business efforts [13], whereas it has been given considerable attention by governments. The EU framework initially was focussed on standard setting and interoperability and only at a later stage included architecture elements.

There are a variety of types of standard, like open standards or technical standards. In general, standards are definite rules or measures established by some authority determining what a thing should be, often accompanied by some criteria to qualify if standards are obtained or not [34]. Standards are aimed at ensuring quality and that different elements are able to interoperate with each other. Standards specify or define policies that are subsequently adopted by a large number of members. Standards are essential for facilitating GA and enables organizations to influence the actions of units without explicitly prescribing how to handle internal information-processing activities [35]. In GA standards are essential for the interaction between public government organizations and their interaction with external entities, by defining interaction interfaced between various systems. There exists a wide variety of standards providing organizing logic for applications, data and infrastructure logic [36], including standards on [35]:

- Physical infrastructure management, standards on underlying technologies required to run organisations, like computers, networks, servers and database management
- Human IT Infrastructure management, standards on human It resources such as organisational IT skills, expertise, competence and knowledge
- Integrating Business applications, to define strategic directions for managing applications and the integration between them
- Enterprise data integration, focusing on the integration of critical data elements and databases for cross-organisational integration, and define data elements

In the Netherlands some standards are referred to in the GA framework, whereas other standards are put on a comply or explain list. This means that designers should adhere to these standards, and if they do not they have to explained this into details.

I Norway a general "Catalogue of standards" (recommended or mandatory) for the public sector is available through a designated web portal. A broadly composed Standardization council maintains the catalogue.

Definition: *Standards are set of well-defined policies and specification used as rules to form unifying practices across projects and organizations.*

3 Conceptualizing Government Enterprise Architecture Impact

In business there is limited knowledge about the effect of EA practices [37] and we found that the same applies to the government domain. The patterns in the previous (sub)sections show the process how GA is used and updated, but not how this process contributes to the creation of public value. Therefore we investigated the overall aims and benefits of the GA. The GA elements are used to create value and these elements are shown on the left in figure 2.

The process we induced from the two countries is aimed at creating observable direct or indirect benefits, which are shown in the middle of Figure 2. Direct benefits include better interoperability, reuse, flexibility/agility and information quality. Indirect benefits include better communication, decision-making and fit between organization and technology.

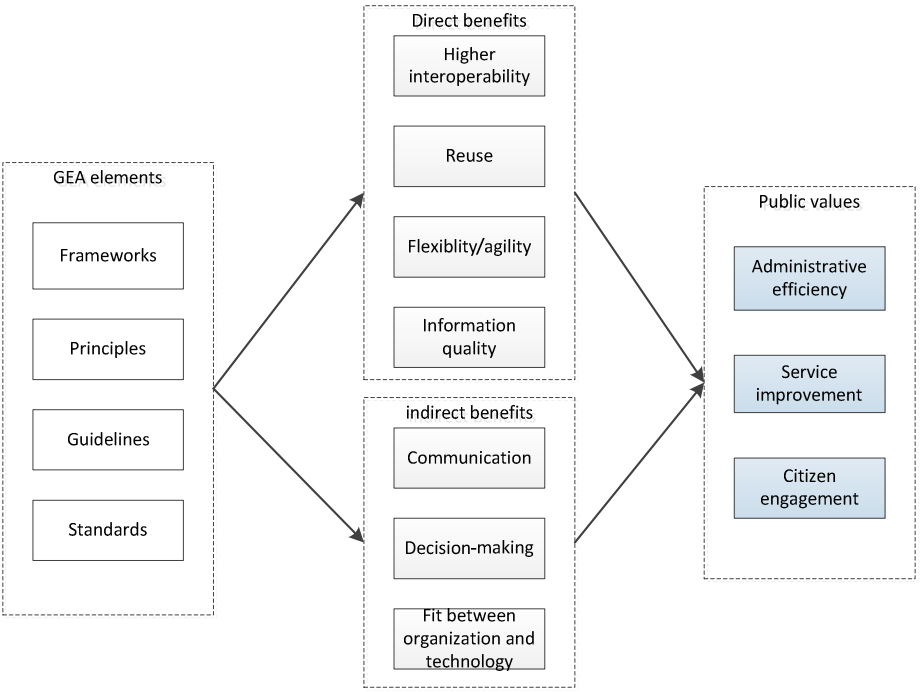

Fig. 2. Conceptualizing GA and its impact

The main goal of government is to create a wide-range of public values for their citizens. Hence, these observable direct and indirect benefits of GEA should contribute to the creation of public values. Public values are a "good, service or outcome which supports, meets or conforms with one or more of an individual or group's

values" [38] are an "important (but often taken for granted) motivation for strategy and implementation of eGovernment projects" [39]. Rose and Persson [39] define three primary values, administrative efficiency, services improvement and citizens engagements which are shown on the right side in Figure 2. Administrative efficiency represents the search for value, expressed by efficiency, effectiveness and economy [39], and are deconstructed into target variables such as return on investments, net present value and increases capacity and throughput. Service improvements derive from customer orientation, focusing on how to use ICT to provide better services to the public [39], including issues like better access to services and information, online access to services, and cost- savings for citizens and other external stakeholders. Values related to citizen engagement combines ideals on community empowerment with democratic values such as citizens access to information [39]. Citizen engagement values relate to the engagement, empowerment and use of eGovernment services for citizens´ involvement, and citizens´ role in the design and development on eGovernment services provided by the public.

Based on the conceptualizing of GA introduced in section 4 above, and the benefits and public value drivers introduced here, we conceptualize intended GA effects. The GA elements result in direct and indirect benefits that ultimately should contribute to the generation of public values.

4 Conclusions

We sought for patterns and common elements of GA in this research. The practices in two countries were investigated and it was found that GA consists of frameworks, principles, guidelines and standards to guide design project and deal with the complexity. These elements are used to direct and guide initiatives occurring at all levels of government. We inductively derived a generic pattern on how GA was used in government. GA frameworks, principles, guidelines and standards were identified as the main concepts used in both countries. Although these four concepts might look clear at first glance, they were not in the practice. For instance, in the Netherlands principles include statements ranging from a very high conceptual level, down to technology-specific statements explicitly telling how to do things. Defining the common elements of GA can result in a vocabulary with enables easier communication between stakeholders. The definition proposed in this paper should be viewed as a first start to better define concepts and can be further refined by investigating more practices. Furthermore, the number of main concepts can be expanded in further research, as GA might serve other purposes and concepts might change over time.

Based on the use of the four concepts a model was developed showing how GA benefits help in the realization of public values. In the situation studied the architectural efforts are focussed on creating benefits like better interoperability, reuse, flexibility/agility and information quality and indirect benefits like better communication, decision-making and fit between organization and technology. Although we acknowledge the importance of these outcomes, these are primarily the benefits viewed from the IT perspectives, whereas the motivation for initiating the architectural efforts was

the creation of public values. Therefore we argued that these direct and indirect benefits should result in three types of public values; administrative efficiency, services improvement and citizen engagement. The resulting conceptual model provides a starting point for conceptualizing the impact of GA and should be further refined and tested in further research.

Although our aim is to provide conceptual clarity among the concept, GA is not a uniform concept and can have various interpretations and purposes. The differences between countries revealed similarities and differences. The Netherlands, being a front-runner in this area, has more years of experience with GA efforts than to Norway. Nevertheless it was rather surprising to see that Norway still has no formal descriptions of GA at least not at the national level. In the Netherlands GA focus has shifted over the years suggesting that concepts might also change over time. Further research is needed to explain differences among countries and to better understand the consequences of the differences. This can help to determine which architectural concepts are essential and which are supportive for creating public values.

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Strategic Framework for Designing E-Government in Developing Countries

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Abstract. Developing countries have embarked on e-government initiatives in their modernization activities, as the developed countries. Despite the effort, implementation of e-government in developing countries is still rated as not sufficient. Several literatures, such as the UN 2012 survey, investigate challenges faced by developing countries; poor management and limited availability of resources being the main ones. Developing an e-government system with limited resources and with the challenges developing countries are facing requires careful planning. The ultimate question is the public value generated and the sustainability of e-government initiatives in developing countries. Our main question driving the investigation in this paper is, therefore, whether guidelines exist to develop e-government solutions with the goal of public value generation in mind. The investigations of literature have unveiled many guidelines for designing e-government systems. However, there is still lack of a comprehensive framework that will enable developing countries to design e-government systems whilst generating public value. In this paper, existing guidelines for development of e-government systems are first reviewed followed by a comparison among the guidelines. Then the challenges for designing e-government systems in developing countries are outlined. Through a consolidated view emerging from the comparison and the outlined challenges, the paper brings forth a comprehensive strategic framework for successful design of e-government systems. The proposed framework is for policy makers and e-government coordinators to design e-government systems in a way that the objectives are met and that the investments generate public value.

Keywords: E-Government systems development, E-government design, Guidelines, Developing Countries, Public value.

1 Introduction

Governments around the world have been embarking on e-government initiatives for more than 10 years [3] and thus building knowledge societies. The benefits and values of e-government have been recognized more and more among governments. Such benefits include enhanced quality of public services, transparency and accountability, cost-effective service provision and government operation, reduced corruption, citizen

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 148–162, 2013.

engagement in public matters, optimization of public policies for better outcomes and integrated government processes [2, 3, 4, 21, 25, 27]. E-government enhances good governance by enforcing good governance principles through implementation. The good governance principles put forward by the OECD are "*legitimacy, rule of law, transparency, accountability, integrity, effectiveness, coherence, adaptability, participation and consultation*" [22]. Many of these benefits have been highly realized in developed countries as compared to developing countries.

The UN survey of 2012 points out that the efforts for e-government implementation in developing countries such as South Africa, the United Arab Emirates (UAE), China, India, Seychelles and Tuvalu have been considerable since 2010. The survey also reveals that the efforts are insufficient compared to the high achievements in developed countries, and that the main challenges faced in developing countries are poor management and limited availability of resources [31]. Developing an e-government system with numerous challenges and scarce resources requires careful planning [12], especially when most of the funding for development of e-government systems in developing countries depends on donors [13]. Therefore, the ultimate questions are the value-add generated by these systems and the sustainability of such initiatives in developing countries. Considerations in designing e-government systems under afore mentioned conditions require a comprehensive design framework, which still lacks in many guidelines proposed in the literature.

The objective of this paper is to propose a strategic framework for design of e-government systems in developing countries. The framework is based on literature research and comparison of existing frameworks. It bases on two frameworks from the literature [34 and 26] and elaborates them further suggesting five aspects of strategic consideration: vision, policies/strategies, programs, projects and evaluation. Evaluation is crucial to understand generation of public value as well as achievement of vision and subsequent policies/strategies. Key aspects addressed and remainder of this paper are: identification and comparison of existing guidelines for design of e-government systems (sections 2 and 3), challenges for designing e-government systems in developing countries (section 4), consolidation of discussed guidelines in a comprehensive strategic framework (section 5) and finally the lessons that can be learned, best practices and recommendations (section 6). The conclusions in section 7 revisit the objectives of the paper and provide an outlook on further research.

2 Reviewing Existing Guidelines for Design of E-Government Systems in Developed and Developing Countries

Many e-government initiatives across countries have been put in place as part of national strategies for economic and societal development. As countries embark further on initiating these strategies, the importance of research in implementing successful e-government is more recognized [35]. Researchers and practitioners around the world have constructed multiple guidelines that countries can adapt in their initiatives. The guidelines for designing e-government systems are of different contexts. In light of understanding the importance of 'country-context' in developing e-government

systems guidelines [5, 13, 25], some researchers have specified whether the guidelines are constructed in the context of developing countries.

To develop an understanding and consolidated view of different guidelines in the literature, we reviewed existing ones in the contexts of developed and developing countries. This approach enables a wider understanding of guidelines from both contexts and hence provides a richer base for the analysis of the study. The criteria for selection of guidelines were: they must be from the contexts of developed and developing countries respectively, they clearly describe the design of e-government systems, they must be implementation guidelines preferably implemented in case study, and developed in academic research or internationally recognisable organisations. The following nine guidelines were studied (of which six are in the context of developing countries) – see also table 1 for a summary of their main activities proposed:

EGOV* is a framework for developing e-government systems at national level with the purpose of ensuring sustainability in developing countries. Along with the specified activities, the framework is developed with pillars of key actors namely the government, local stakeholders and external assistance and principles which are: national ownership, strong leadership, stakeholder engagement and balancing internal and external roles [9].

Clockwork suggests a framework consisting of five stages for implementing e-government projects. The author proposes important aspects of consideration along with the framework: environmental complexity in implementing ICT, project prioritizing proportional to public value, employee capacity, and choice of technologies in respect with organizational processes, management and cost underestimation (Clockwork cited in [12]).

Bhatnagar proposes nine guidelines for designing e-government systems at national level in developing countries. The author discusses that e-government implementation comes with diverse goals and objectives such as transparency, efficiency, anti-corruption and effectiveness. Furthermore government reformation requires careful planning along availability of resources and country-context [5].

Rabaiah and Vandijck propose a practice-based strategic framework for e-government based on modules. The principles of module-based design of the framework are: flexibility, extensibilities and customisability. The framework is developed following a review of strategies in the literature from different countries [23].

E-government transition model is a maturity model that explains step by step transition of government into an electronic government. The authors however argue that the model is not sufficient enough to be an operational model since there is no defined guideline for transformation, citizen engagement and development of web-enabled services [8].

UNESCO e-government action plan is a guideline for stakeholders in developing countries in initiating, developing and sustaining e-government initiatives. The stakeholders addressed in the guideline are parliamentarians, government executives and non-governmental organisations [30].

Republic of Korea's implementation of the UNESCO action plan has resulted in a toolkit developed based on the country's experiences. The toolkit serves as a guideline in helping developing countries to successfully implement e-government initiatives; and gain a comprehensive understanding of e-government [28].

E-government development framework in Singapore involves three implementation stages: initiation, infusion and customization [16]. The framework is based on e-democracy framework developed by Watson and Mundy [32].

Mundy and Musa propose a framework for state level e-government in Nigeria. The framework emphasises policy formulation, implementation, and IT education and citizen sensitization through channels such as mobiles, cyber cafes, kiosks etc. [20]. In the next section, we provide a comparison of these nine guidelines.

Table 1. A review of e-government guidelines along their main activities

Framework / guideline	Main activities as suggested in the Framework/Guideline
EGOV* framework for developing countries [9]	Examine e-government readiness Formulate e-government vision and strategy Develop e-government program Build human capacity Build institutional capacity Build research capacity
Framework for e-government [12]	Examine e-government readiness Identify and prioritize themes Develop e-government program Apply to target groups and implement
Guideline for designing country wide e-government strategy (for developing countries) [5]	Formulate a strategy and implementation plan Examine e-government readiness Determine implementation approach (bottom up vs. top down) Implement pilot projects Build institutional capacity (public private partnership) Develop supporting frameworks (legal, economic) Formulate a reform strategy (incremental change vs. big bang) Evaluate projects Determine risk factors
Strategic framework for e-government [23]	Formulate e-government vision Outline strategic objectives Determine the users Determine delivery models (G2G, G2C, G2B, G2E, G2N) Outline guiding principles (one-stop, packaged services etc.) Determine delivery channels (Web, in-person, phone etc.) Identify priority areas (service delivery, internal efficiency etc.) Outline major initiatives (government portal, taxation system etc.) Develop infrastructure Develop supporting frameworks (organization, legal, interoperability) Outline implementation guidelines (reusability, e-signature etc.)
Government to e-government transition [8]	Formulate e-government vision Implement initial e-government technologies Formulate an alignment plan of government and e-government strategies Align government and e-government strategies and systems Transform government processes and systems
UNESCO e-government action plan (for developing countries) [30]	Formulate e-government vision Raise e-government awareness Build human capacity Build institutional capacity (establish an apex organization and partnership) Develop infrastructure Develop supporting frameworks (laws, policies) Prioritize and implement pilot projects

Framework for Nigeria e-government development (for developing countries) [20]	Formulate e-government policy Publish information online with partial citizen participation Establish interaction among government, businesses and citizens via website with partial citizen participation Establish transaction of government services via website with partial citizen participation Set up e-government portal with partial citizen participation Establish full citizen participation at all government levels	
E-government Action Plan: lessons from republic of Korea (for developing countries) [28]	Pre-implementation	Establish leadership and raise awareness Build institutional capacity (public private partnership etc.) Examine e-government readiness Benchmark other leading practices
	Implementation	Formulate e-government vision and goals Develop implementation roadmap Determine implementation approach (bottom up vs. top down) Build capacity (human, financial, technical, legal etc.) Develop e-government system
	Post-implementation	Evaluate and monitor projects Perform system operation and maintenance Manage information and technological resources Manage system utilization and review e-government outcomes
E-government development in Singapore (for developing countries) [32]	Initiation stage	Formulate e-government vision Publish information online Set up e-government portal
	Infusion stage	Formulate action plan Outline guiding principles Build capacity (human, financial, technical, legal etc.) Develop infrastructure Raise awareness
	Customization stage	Integrate services for collaboration among government agencies Incorporate CRM in e-services Monitoring e-government projects

3 Comparison of Existing Guidelines

The comparison is performed using clustering analysis. Jain et al. define clustering as "*exploratory data analysis technique*" and "*unsupervised classification of patterns into groups (clusters) based on their similarities*" [15]. The authors outline stages of clustering technique illustrated in Fig. 1 consisting of feature selection, similarity characterization and grouping to form clusters.

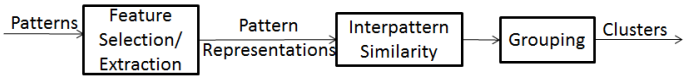

Fig. 1. Stages in clustering according to Jain et al [15]

Based on this clustering analysis model, the feature selection criteria for the activities of guidelines/frameworks were based on the output/purpose of activities. Furthermore for each activity in the guidelines, keywords such as vision, strategy, implementation plan, roadmap, evaluation etc. were analysed. Subsequently, identified keywords and activities

with similar output/purpose were grouped into clusters as illustrated in Table 2. The first column of the table names the clusters of activities, followed by number of occurrences in guidelines and reference to the literature, in which the activities were mentioned. The last column of the table indicates the number of activities occurring in guidelines identified for developing countries.

The comparison in Table 2 illustrates that clusters such as formulation of e-government vision, formulation of e-government policy/strategy, examination of e-readiness, and implementation of e-government (programs, pilot projects, system, portals) are observed most among the guidelines (≥4). Other activities are observed only in one or two guidelines such as benchmarking practices from other countries, establishing political leadership, establishing citizen participation, determining risk factors, determining delivery models and/or channels, e-government integration and/or alignment, and e-government transformation.

Table 2. Comparison of guidelines for designing e-government systems

Cluster of activities	No. of occurrences of activities and reference to frameworks / guidel.	Of which f. developing countries
Formulate of e-government vision	6 from [8, 9, 16, 23, 28,30]	4
Formulate of e-government policy/ strategy	4 from [5, 9, 20, 23]	3
Examine e-readiness	4 from [5, 9, 12, 28]	3
Raise awareness	3 from [16, 28, 30]	3
Benchmark practices from other countries	1 from [28]	1
Formulate implementation plan, roadmap, approach, guidelines and/or principles	5 from [5, 8, 16, 23, 28]	3
Implement e-government (programs, pilot projects, system, portals)	9 from[5, 8, 9, 12, 16, 20, 23, 28, 30]	6
Develop infrastructure	3 from [16, 23, 30]	2
Prioritize projects and/or themes	3 from [12, 23, 30]	1
Build capacity (human, institutional, technical financial, research)	6 from [5, 9, 16, 23, 28,30]	5
Develop supporting frameworks and/or standards (legal, economic, organization, interoperability)	3 from [5, 23, 30]	2
Establish political leadership	1 from [28]	1
Establish citizen participation	1 from [20]	1
Evaluate, monitor and/or maintain projects	3 from [5, 16, 28]	3
Determine risk factors	1 from [5]	1
Determine delivery models and/or channels	1 from [23]	-
E-government integration and/or alignment	2 from [8, 16]	1
E-government transformation	1 from [8]	-

Another observation drawn from the comparison is the difference in scope of activities among the guidelines. Some guidelines are based on experiences from specific countries such as Republic of Korea [28], Singapore [16] and Nigeria [20], others

build on contexts of developing countries [5, 9, 30], and yet others have no specific context [8, 12, 23]. Activities such as formulation of e-government vision, formulation of e-government policy/strategy, examining e-readiness, implementation of e-government (programs, pilot projects, system, portals), formulation of implementation plan, roadmap, approach, guidelines and/or principles span across all scopes of guidelines. Furthermore most guidelines do not provide clear relations among the different activities suggested, which may result in unclear objectives of activities and hence difficulties to measure and to ensure benefits and value-adds along the process. The findings further reveal a lack of comprehensive reference frameworks to guide countries in designing and managing e-government initiatives.

Before we present our framework, insights into the challenges for designing e-government systems in developing countries are discussed in the next section.

4 Challenges for Designing E-Government Systems in Developing Countries

Implementation of e-government systems signifies interrelations between the government and citizens (G2C), government and businesses (and non-profit organizations) (G2B, G2NPO), intergovernmental agencies and departments (G2G) and government and employees (G2E). Designing and sustaining e-government systems requires rigorous consideration of political, economic, technological, social, cultural and legal status of the country. Such prerequisites impose significant design challenges, which have to be faced by developing countries. Most developing countries suffer from emerging economies, high corruption, political instabilities, unclear legal structures and diverse social and cultural norms, which greatly contribute to the challenges of designing e-government systems. Table 3 sums up challenges and barriers in designing e-government systems in developing countries as documented in literature.

Table 3. Challenges for designing e-government systems in developing countries

Challenge	Source (s)
Political & organizational leadership	[4, 10, 11,21, 24, 27, 30]
Formulation of strategy and policy	[4, 21, 24]
Prioritization of initiatives	[25]
Availability of financial resources	[10, 11, 25, 30]
Public-private partnership	[4, 21]
ICT literacy of public sector employees	[4, 10, 11, 21, 24, 25, 27, 30, 31]
ICT literacy of end user	[2, 21, 25, 30]
Formulation of legal framework	[4, 21, 24, 27]
Formulation of security and privacy guidelines	[2, 10, 24]
Cultural factors	[4, 10, 11,21, 27, 30]
Infrastructure	[2, 4, 10, 11, 21, 24, 27, 31]
Integration of backend processes	[10, 31]
Awareness of opportunities	[24, 25, 30]

The challenges outlined above emphasize the necessity to vigilant planning and implementation of e-government system in developing countries. Furthermore, the challenges emphasize the need for evaluating e-government systems for measuring their benefits and public value-add towards sustainable economic and social developments and the knowledge society. The next section therefore proposes a comprehensive framework for e-government systems design, while accounting for the challenges in designing e-government systems in developing countries and introducing a step of evaluating public value-add and benefits of e-government initiatives.

5 Consolidating Guidelines into a Comprehensive Strategic Framework for Designing E-Government Systems

In section 3, existing guidelines for designing e-government systems were compared using clustering analysis technique. Among other observations previously discussed, eight guidelines indicate vision and policy/strategy as entry points to embark on e-government initiatives followed by implementation plans and execution where most activities in the guidelines involve different stages of executing the plans. However the relationship between the stages is unclear and, therefore, it remains difficult to evaluate and measure the value-add.

In this regard, we herewith compose a strategic framework emphasizing that public value-add is considered in e-government initiatives. The framework provides a clear entry point and a clear relationship among different activities involved in developing e-government systems, and in turn providing policy makers and e-government coordinators the ability to better measure the value-add and resulting benefits of initiatives.

The proposed framework embarks on previous literature: In their work to study the innovation of e-participation in the European regions, Scherer et al. outline a concept, which describes the relationship between strategies, programmes and projects. The authors describe a strategy as "*a long term plan of action*", which is implemented through programs bound by duration and budget. The programs are then implemented through projects [26]. Wimmer outlines "*e-government application layers*" consisting of three dimensions: political and strategic, implementation and operation. The first dimension is comprised of formulating a vision and strategies, whereas the latter is supported by concepts such as Business Process Re-engineering (BPR) and New Public Management (NPM). Initiatives are then formulated, in which the strategies are assessed through allocated financial and operative resources. If agreed upon, then the initiatives are implemented in the next dimension through projects. The last dimension describes application of ICT in public administration. The results and experiences of the process are reviewed through feedback from the applications to the projects, initiatives, strategies and vision, hence, an iterative cycle with feedback on the success of ICT applications towards the stated vision and strategies [34].

On the basis of the guidelines outlined in sections 2 and 3, as well as of the models proposed in [26] and [34], figure 2 presents the strategic framework for e-government design.

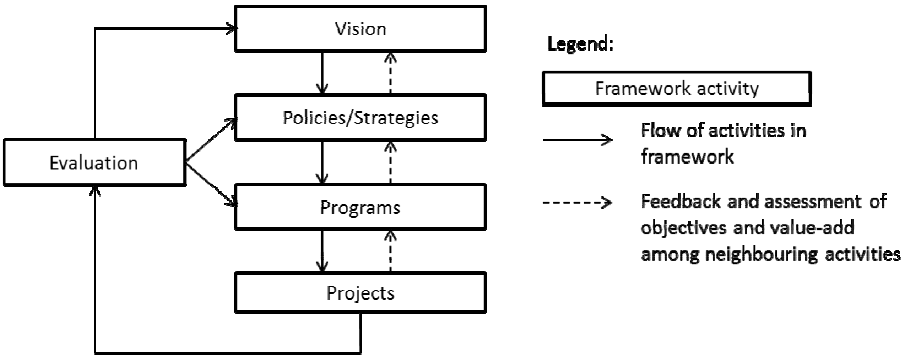

Fig. 2. Strategic framework for e-government systems design

The overall nature of the framework is iterative, because for each evaluated project, reflection is necessary to map the whole development process with the vision. The feedback between two neighbouring activities is introduced to ensure evaluation in each activity, and not only along the whole process cycle. The subsequent subsections outline each of the activities of the framework, which reflect the clusters of activities emerging from the analysis outlined in Table 2 and the challenges for designing e-government systems in developing countries outlined in Table 3 above.

5.1 Vision

A vision is a long term view of where an organization wants to be and acts as an overall guiding principle in an organization hence bringing forth the importance of articulating vision statements before starting an endeavour. Vision statements provide the basis of achieving certain objectives. In e-government the statements define the state of government after a certain period of time. Each country has its own vision which reflects national priorities, the economic and political context of a country [28, 30]. Furthermore, formulation of vision statements should involve stakeholders such as governments, citizens and businesses [9, 30]. Vision statements should also include e-government goals and directions which are shared among stakeholders and all government levels [18].

Formulating a vision statement is the first step through which the policies and strategies of e-government are derived. Many vision statements in this regard include phrases such as citizen centric, recognition as a leader in e-government implementation, responsive, innovative, easily accessible, transparent and consumer-based governments. Vision statements also provide a basis for governments to measure the value of implementing e-government systems through goals foreseen in the statements.

5.2 Policies/Strategies

Policies and strategies describe a set of commitments to implement actions in order to achieve the vision statements. They define detailed goals and objectives for

implementation which reflect the overall vision. Also defined here are the political, economic, social, cultural, technological and legal prerequisites necessary for implementation. Risks and risk management are also defined in policies and strategies. Application of ICT in public sectors poses several risks such as organizational, technological, skill, infrastructure, financial and legal risks [1, 32]. Therefore these should be addressed while setting policies and strategies. Other aspects for implementation such as change management, public-private partnership, organizational and business architectures are also defined in this stage.

Nation-wide e-government policies and strategies are important so as to form an alignment of implementation from the national to local levels. The significance of such alignment is to ensure re-usability and interoperability among solutions, traceability, monitoring and evaluation of resources across all levels. Examples of policies and strategies are formulations of e-government agencies and units to coordinate nation-wide e-government initiatives, formulation of government portal and provision of electronic services and formulation of e-government framework.

5.3 Programs

E-government policies and strategies are implemented through a set of defined programs [26, 34]. Such programs must reflect the goals and objectives described in policies and strategies. A program stems implementation approaches adopted in projects in the next step. Acknowledging the wide scope of government transformation through ICT and limitation of resources, it is important to formulate a series of programs which oversee the implementation of projects.

The first purpose is the ability to prioritize implementation of projects. Several e-government projects working towards dependent objectives and goals in certain program provide the ability to prioritize them. The programs ensure that the projects are prioritized according to available financial and human resources, benefits and impact. The second purpose is careful planning of resources. Due to scarce resources available in developing countries, a series of programs ensures that for each program there is definitive amount of resources dedicated, and risks from one program can be transferred to subsequent programs. The third purpose is the high level of traceability among projects in programs. Management of programs becomes more viable as compared to scattered implementation projects working towards diverse objectives and goals. An example in this regard is a program that oversees the resources required for constructing e-government portal and coordination of services offered in the portal. The program determines financial and human resources, cost, and design of services in the portal such as designs according to life events.

5.4 Projects

In this step the programs are implemented in projects. Each project is implemented towards certain detailed objectives and goals reflected in a program [26]. And such

objectives must also reflect the overall national e-government vision. The most preferable implementation approach in projects is through pilot projects with considerable scope. The significance of this approach is to minimize risks, measure benefits of projects in early stages, assess the demand of initiative from stakeholders and learn lessons for future projects [5, 7, 29, 30]. Adopting concepts and practices from Information Systems field, implementation of projects consists of activities such as requirements gathering and analysis, design approaches, development, implementation and monitoring and evaluation. Other activities relevant to e-government projects are also suggested in the literature such as global and local surveys on similar projects to obtain lessons and best practices, training of staff and research to gain state-of-the art solutions and implementation approaches [5]. Examples of projects are the provision of electronic services such as birth registration, electronic allocation of land, computerization of departments and ministries.

5.5 Evaluation

In order to best measure the value-add, progress and if the results of the project concur to the overall vision, objectives and goals of policies and strategies as well as of programs, evaluation is an important aspect. The purpose of evaluation in this guideline is to provide the basis for measuring the value of e-government projects to the governments as providers of services; and citizens, businesses and non-governmental organizations as receivers of services. Evaluation of e-government projects is also significant to assess the status of development, perform SWOT analysis as a learning basis [17, 29] and improve policy making for future implementation [19]. Furthermore evaluation provides the basis for more effective policies and strategies by assessing customers' needs and their expectations [31].

Several evaluation methods exist in the literature in which authors describe the indicators and factors for evaluation. Implementation of e-government initiatives from setting of vision statements to implementation in projects is country-specific, characterized by distinctive political, economic, social, cultural and technological status. Therefore the indicators for measuring the values and benefits of e-government initiatives should reflect the vision of e-government and the status of the country along the mentioned characteristics. Also supported by [2], the authors propose an evaluation framework covering economic, social and technical aspects. The aspects are elaborated further into performance, accessibility, cost-saving, openness, trust and usefulness of e-government initiatives. Other indicators used in evaluation are such as back office and front office (supply and demand), and impact of e-government to government and its customers [17]. Syamsuddin proposes an evaluation framework for developing countries [29] based on the ITPOSMO model (Information, Technology, Processes, Objectives and values, Staffing and skills, Management systems and structures and other resources) developed by Heeks [13]. Heeks uses the model to describe the gap existing between the status of the country implementing e-government and design of e-government initiatives in which he described the gap as highly contributing to the failure of most e-government initiatives in developing countries [14].

6 Lessons Learnt and Recommendations

The development of the strategic framework proposed in this paper relied on the comparison of nine guidelines found in literature. Along the study, several lessons and recommendations of best practices to design e-government systems emerged, which are summed up in this section.

The first recommendation is preliminary research on innovative solutions and best practices. The role of research for successful e-government is highly noted in the literature [9, 35]. The e-government field has evolved tremendously in the past decade and the level of maturity is enormously different between developed and developing countries, and also among developing countries as the UN survey 2012 evidences [31]. Such gap provides an opportunity for countries to leverage and exchange knowledge on innovative solutions and practices.

Designing national e-government frameworks should consider political, economic, social, cultural and technological status of the country. Heeks reasons that most e-government projects in developing countries fail due to the gap between the design of e-government systems and the reality [13]. Many developing countries implement e-government systems designs from developed countries without taking into consideration the differences in historical and cultural aspects, infrastructure, people, economic and government structures [6].

In order to provide practical experiences and to facilitate successful e-government adoption in developing countries, governments should encourage more publications from their experiences illustrating frameworks, challenges, failures, risks and proposed remedies. Such collaboration will reduce failures, encourage application of innovative solutions among governments and enhance empirical learning.

Designing systems, which clearly reflect on users' needs, is also crucial for successful systems. It will ensure usability and successful adoption of the systems. Users' needs reflect factors such as design of e-services (such as life events designs), channels of services (offline and online), languages and prioritization of projects which contribute to significant values to societies.

Finally, the framework proposed in this paper is useful for e-government coordinators and policy makers in design of e-government. The framework recommends political, social, cultural, economic and technological prerequisites, and risks to be analysed at an early stage of designing e-government systems. Formulation of the vision and objectives of policies/strategies should reflect the status of the country along the mentioned prerequisites. This will enhance an early discovery of potential challenges; therefore development of proper remedies along programs, projects and evaluation are crucial. Furthermore, it will enable proper planning of resources as governments will be able to design and prioritize e-government initiatives based on available human and financial resources.

7 Conclusion

Developing countries have embarked in implementing e-government systems as developed countries. Faced with many challenges, designing valuable e-government initiatives

require careful planning and management. Many guidelines for designing e-government systems are proposed in the literature, whereas some of the guidelines are developed in the context of developing countries and others not. However there is still lack of a comprehensive guideline that will enable developing countries to design e-government systems in very challengeable environments whilst generating value from the initiatives.

The paper also investigates challenges for designing e-government systems in developing countries to better understand issues documented in the literature based on practice and reviews. Developing countries are faced with many political, social, cultural, economic and technical challenges such as poor support of political leadership, ICT illiteracy, cultural resistance, limited financial resources and lack of infrastructure. On this basis, a strategic framework for e-government systems design in developing countries is suggested. The framework consists of five activities: vision, policies/strategies, programs, projects and evaluation. The vision determines the desired state of government after a certain period of time. The policies/strategies describe a set of political commitments with detailed goals and objectives that reflect the vision. The programs determine strategies and actions to be implemented in projects with a commitment of financial resources. The projects implement the goals described in the programs. The last activity is evaluation which enables governments to ensure that the projects generate desired values, measure the state of e-government and better plan for future policies/strategies.

The paper concludes with lessons learnt from the development process of the framework and recommendations for designing e-government systems in developing countries. To conclude, further research on reviewing existing guidelines and practical experiences of applying the framework is needed and is planned as next steps.

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Performance Management of IT in Public Administrations: A Literature Review on Driving Forces, Barriers and Influencing Factors

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Abstract. The increased importance of IT in the public sector results in a greater need to establish IT performance management mechanisms. Public administrations need to control IT related investments by using performance management in order to assess and reduce IT costs. However, public sector organizations are only slowly adopting performance management of IT. So far, the driving forces, barriers and influencing factors regarding performance management of IT in the public sector have not been analyzed. The aim of this paper is to identify, analyze and discuss these driving forces, barriers and influencing factors by conducting a literature review and to show how performance management of IT can be designed in the public sector in order to improve its acceptance.

Keywords: performance management of IT, public sector, barriers, driving forces, influencing factors.

1 Introduction

The relevance of information technology (IT) in the public sector has increased rapidly [1]. Currently, many processes in public administrations are dependent on IT. Not only the reduction of IT costs, but also the effective use of IT has become more and more important. As IT is such an important resource, it needs to be managed and controlled. Until now, many public IT managers have no transparency over IT costs or the detailed IT usage, since basic performance management (PM) data, e.g. the number of IT projects, hardware or software licenses, are missing. Performance management of IT (IT PM) is an instrument which addresses this issue. It is defined for the public sector as "the regular collection and reporting of information about the efficiency, quality, and effectiveness of government programms" [2].

In the private sector, IT PM has been used as a decision-making instrument for a long time [3]. In contrast, public administrations are still facing big challenges concerning the implementation and use of IT PM concepts [4-8]. How IT PM can be implemented and used in public administrations is still an under-researched field [9]. As a starting point for the improvement of the implementation and use of IT PM, driving forces and barriers as well as influencing factors need to be identified and analyzed. For this purpose, this contribution is guided by the following questions:

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 163–174, 2013.

- Which driving forces, barriers and influencing factors regarding the implementation and use of IT PM can be identified?
- Which consequences can be derived from these findings that can be used to design IT PM within public administrations in order to improve its acceptance for different stakeholder groups?

The remainder of this paper is structured as follows: First, the research methodology is described. Second, the findings of the literature review are presented. Third, these findings are discussed and a solution for designing IT PM in a way so that it can augment its acceptance is given. Finally, a conclusion is made and further research possibilities are presented.

2 Research Methodology

A literature review according to Webster and Watson [10] with focus on peer-reviewed journals of the VHB list of 2011 and the WI journal list of 2008 as well as e-government specific conferences, like FTVI, HICSS and IFIP eGOV[1], was performed. Journals were classified as relevant if their journal name indicates that they deal with information management, performance management or issues of the public sector. Table 1 shows the three categories of search terms used in the literature review. The search terms of category one were combined with those of category two and/or category three by using and- as well as or-combinations.

Table 1. Search terms for the literature review

Category 1	Category 2	Category 3
• performance measurement • cost benefit analysis • evaluation • management accounting • controlling	• IT • information system (IS)	• government • public sector • public administration • e-government • new public management

Altogether, 583 papers were found with these search terms. From these, 197 papers dealt with the topic of PM. These PM papers were read and searched for descriptions or enumerations of driving forces, barriers and influencing factors. The identified driving forces, barriers and influencing factors were analyzed and further classified. The number of references behind the particular driving force, barrier or influencing factor shows how often it has been found in literature (see Table 2, Table 3 and Table 4). 48 contributions describing driving forces, barriers or influencing factors concerning PM were

[1] FTVI: Fachtagung Verwaltungsinformatik, HICSS: Hawaii International Conference on System Sciences, IFIP eGOV: International Federation for Information Processing Electronic Government.

identified. From these, 37 contributions are descriptions of case studies within public administrations in the U.S. (7), Australia (7), U.K. (6), New Zealand (3), Italy (3), Greece (2), Finland (1), Danmark (1), Sweden (1), Suisse (1), Netherlands (1), Canada (1), Russia (1) and Germany (1) as well as a comparison of different countries of the European Union (1). Six contributions have an empirical research approach. Two have a change management view regarding PM. Three contributions are based on theories, like institutional theory or public choice theory.

After the analysis of the identified driving forces, barriers and influencing factors, the databases Emerald Management and Ebsco were searched using the search terms in order to strengthen the methodology. This search did not induce new findings regarding the prior search in the journals and conferences. Hence, we conclude that our search within these journals and conferences has been sufficient and general enough to derive our findings for the discussion and conclusion.

3 Findings

3.1 Driving Forces and Barriers

This section summarizes the driving forces and barriers identified in the literature review. We defined a driving force as a reason why IT PM is implemented and should be used within public administrations. The driving forces for the implementation and use of IT PM can be classified into driving forces which are related to the internal management and those which come from requirements from outside (Table 2).

Table 2. Driving forces regarding performance management of IT

Driving forces - internal management	Driving forces - outside
• "what gets measured gets done" [11-14] • support for decision-making [15-26] • improvement of management [12, 17, 18] • budgetary control [18, 22] • improvement of efficiency [20, 22, 26-31] • improvement of effectivity [20, 22, 26, 27, 29-31] • motivation of employees [11] • ability to identify trends [29]	• creation of transparency [11, 12, 14, 20, 22-24, 26] • fulfillment of laws, regulations or standards [14, 21, 32-34] • pressure/requirements from outside [16, 17, 27, 30, 32, 35-37] • improvement of accountability [7, 12, 16, 19, 21, 24-28, 37, 38] • improvement of quality of services [11, 23, 25, 31]

These driving forces face several barriers which hamper and complicate the successful implementation and use of IT PM. The barriers have been analyzed if they affect the implementation, the use or both (Table 3). The barriers regarding only the use of IT PM can be assigned to the domains difficulties with the use of information,

difficulties with key performance indicators (KPIs) as well as personnel resources and skills. The barriers concerning both the implementation and use of IT PM deal with strategic questions, stakeholder concerns and organizational or political factors.

Table 3. Barriers regarding performance management of IT

Barriers for implementation	Barriers for use
• resistance at top management [7, 39] • no stakeholder involvement [40]	• information not used efficiently [7, 15, 16, 25, 27, 30, 41-43] • KPIs without informative value [7, 12, 25, 27, 38, 44] • manipulation of KPIs [45] • changing KPIs [30, 46] • no skills of employees in collecting, analyzing and interpreting KPIs [7, 44, 47] • no resources available for collecting, analyzing and interpreting KPIs [7, 39, 43] • no access to performance management information so that it cannot be used for decision-making [28, 45]
Barriers for both implementation and use	
• different requirements of stakeholders regarding performance management [48] • no IT awareness at top management [49, 50] • no clear objectives [26, 30, 50] • definition of performance for public services difficult [7] • no presentation of the benefits of performance management [23, 50, 51] • autonomy of departments [50] • more bureaucratic effort [12, 24] • political determining factors (e.g. political election cycles) [23, 52, 53]	

3.2 Influencing Factors

Influencing factors are determining factors which influence the successful implementation and use of IT PM. They can become either a driver or a barrier. The influencing factors identified for the implementation as well as the use of IT PM concepts are classified into general, internal and external influencing factors (Table 4). Some of these influencing factors can also be found at the driving forces, e.g. rules and regulations or external requirements. Influencing factors like missing resources, lack of presentation of benefits or missing skills of employees lead to barriers which complicate the implementation and the use of IT PM. All these influencing factors - except for the political level - can be found in the private sector [54].

Table 4. Influencing factors concerning performance management of IT

Internal influencing factors	External influencing factors
• availability of resources (time, cost, employees) [15, 17, 27, 42, 55, 56] • acceptance at management [15, 17, 19, 23, 24, 28, 55, 57, 58] • acceptance at politics [17, 27, 33, 55] • availability of objectives from which KPIs can be derived [17, 21, 24, 26, 42, 55, 58] • technical support for collecting, analyzing and interpreting performance management data [24, 27, 28, 55] • skills of employees regarding the collection, analysis and interpretation of performance management data [19, 33] • internal requirements [17, 42] • (internal) stakeholders [17, 42] • presentation of benefits to the stakeholders [28, 32] • access to information and performance management data [42]	• external requirements [26, 42] • (external) stakeholders [17, 42] • laws, rules and regulations [21, 26, 32-34, 52]
General influencing factors	
• culture of an organization [20] • availability of a cultural change [28] • size of an organization [33] • organizational form [9] • performance of an organization [33] • political environment [23, 26, 54]	

4 Discussion

Fig. 1 summarizes the identified driving forces, barriers and influencing factors concerning the implementation and use of IT PM. In general, the findings show that the influencing factors are derived from the driving forces and barriers – except for the internal influencing factor technical support. However, this influencing factor can also be found in a private sector context. Hence, we recognized that these influencing factors identified in public management literature have a huge analogy to those of the private sector. Further, missing influencing factors lead to barriers, whereas the availability of an influencing factor can be seen as driving forces for the implementation and use of IT PM.

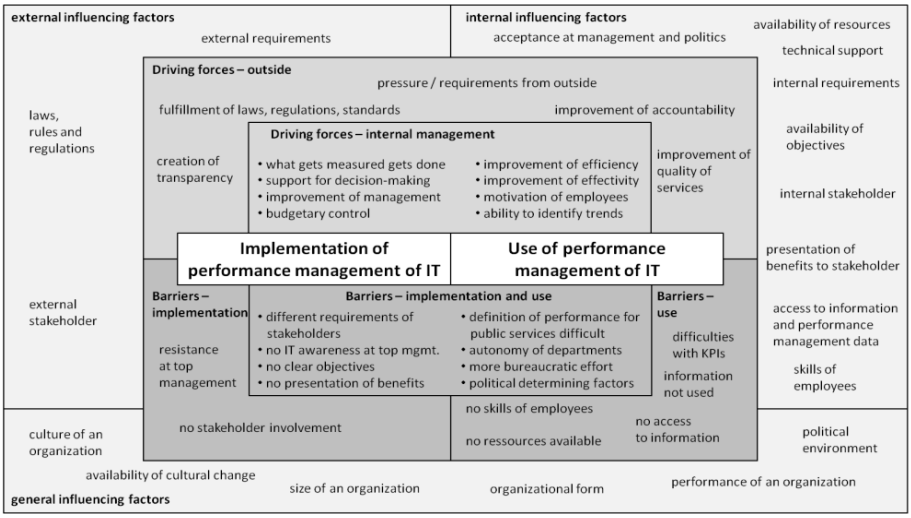

Fig. 1. Influencing factors, driving forces and barriers regarding IT performance management

We found that IT PM is mostly implemented in order to support decision-making [15-26], to create transparency [11, 12, 14, 20, 22-24, 26] as well as to improve accountability [7, 12, 16, 19, 21, 24-28, 37, 38], effectivity [20, 22, 26, 27, 29-31] and efficiency [20, 22, 26-31]. It should contribute to make public administrations more managerial and to make the IT usage more transparent and homogenous. All driving forces categorized into internal management can be found in the private sector as well. Thus, one would expect that IT PM could be implemented and used in the public sector in a similar way as in the private sector.

In contrast to the private sector, public administrations do not have shareholders as external stakeholders, but politicians and citizens who want to know more about the performance of their administrations. As a consequence, the driving forces caused from outside mostly support a justification towards these external stakeholders concerning the effective use of IT. Most countries where PM is already implemented in public administrations have laws, standards or regulations backing the implementation of PM [14, 21, 32-34]. However, it turns out that realizing these advantages is complex and difficult in a public sector context, as these driving forces face many different barriers.

The barriers concerning only the implementation can be seen as challenges which arise during any change. Change in public sector organizations is difficult to realize, since public administrations have a structure which needs to be stable and continuous [59, 60]. The two most important barriers which could be found during the literature review are lack of an effective use of information and missing stakeholder involvement. We recognized that these two barriers affect many other barriers regarding the use of IT PM: The KPIs often do not meet the requirements of the stakeholders, since there is no stakeholder involvement during the implementation process. Hence, they need to be changed and adapted to the stakeholders' requirements. Further, as the KPIs do not consider the requirements, they do not have any informative value for

public IT decision-makers. As a consequence, the information which can be derived from the KPIs is not used by them, i.e. no control impulses are derived from IT PM and there is no strategic IT PM [7, 15, 16, 25, 27, 30, 41-43]. As public IT managers do not know the benefits which PM can have for them, they do not see any additional value, but only a greater bureaucratic effort. Hence, they provide only few resources for collecting, analyzing and interpreting PM data and they do not improve the skills of their employees regarding PM. In turn, this results in collecting and reporting data of low informative value. To break this cycle, it is necessary to find a way how and when the benefits of IT PM need to be presented to the IT managers.

In the private sector, the maximization of profit is mostly the major organizational objective, which is pursued by the whole company. In public administrations, not profit maximization, but promoting the public welfare can be seen as the major objective of all governmental departments [61]. Further common objectives from a cross-departmental view are the reduction of IT costs, cost effectiveness or quality intensification. However, there are many different stakeholders in the public sector - like IT managers of departments or IT managers of a central common IT unit - with different interests and objectives due to their regional departmental view, as each department has its own objectives derived from the departmental function [62, 63]. Thus, the cross-departmental objectives only play a minor role for departmental IT managers. The different requirements of the various stakeholders result in a great number of different objectives so that an overall, major objective can only be defined with great difficulties in public administrations. Consequently, the IT usage can hardly be controlled using one overall, cross-departmental IT PM concept. This fact makes it necessary to design IT PM in such a way so that it considers both the cross-departmental and the individual, departmental requirements [9]. Thus, IT PM of private sector organizations cannot simply be transferred to public administrations without adaptation.

As these barriers heavily influence the successful implementation of IT PM concepts, one needs to find a way to diminish or avoid these barriers. During the literature review, we found that laws, regulations or standards can help to implement IT PM by pressure from outside [14, 21, 32-34]. In many countries where PM is already implemented there are legal requirements to report and inform – mostly external – stakeholders [45, 52, 64]. However, these legal requirements do not guarantee that KPIs are not manipulated or collected without accuracy and that PM information is used effectively. According to Padovani, Yetano and Orelli [23] external pressure and requirements do not contribute to the successful implementation and use of PM. As the barriers which were identified during the literature review cannot be diminished by legal requirements or pressure from outside, we follow the conclusion of Padovani, Yetano and Orelli [23].

One way to guarantee the effective and stable use of IT PM without external pressure is to design PM in a way that it meets the requirements of different stakeholders. Stakeholders of public administrations can be internal, like IT managers, policy makers or employees, and external, like citizens, politicians, other public organizations or media. Internal stakeholders mostly use PM information for decision-making and internal management. In contrast, external stakeholders use this information to control accountability and the achievement of objectives [21, 60, 62]. As all these

stakeholders have different objectives and requirements regarding IT PM, these stakeholders and their requirements need to be analyzed and one needs to find a way on how the benefits regarding IT PM can be presented to the different internal and external stakeholders. Therefore, benefits management could help solving this issue [51]. Benefits management describes the process of organizing and managing so that the benefits of the use of IT PM can be realized. The aim of benefits management is to pursue the benefits both during the implementation and the use of an investment or in this case IT PM [65]. Until now, almost no research is done concerning benefits management – linked with IT PM – in public administrations [51].

5 Conclusion

This contribution summarizes the findings of a literature review on driving forces, barriers and influencing factors concerning the implementation and use of IT PM in public administrations. There is a great number of driving forces, like creation of transpareny [11, 12, 14, 20, 22-24, 26] or improvement of decision-making [15-26]. These driving forces face a huge number of barriers regarding the implementation and use of IT PM concepts. The barriers can be categorized into barriers affecting only the implementation, barriers concerning the use of information, barriers with KPIs as well as bariers due to personnel resources and skills. There are also barriers which affect both the implementation and use, like barriers due to strategic questions, stakeholder concerns and organizational or political factors. Some barriers are a consequence to the non-fulfillment of influencing factors. During the literature review, a huge amount of influencing factors could be identified, which range from internal to external influencing factors (Fig. 1). Further, we found that the most important issue which affects PM is the fact that there are many different stakeholders with different objectives and requirements regarding the control of IT. Thus, IT PM needs to be designed in such a way that it considers the cross-departmental as well as departmental requirements. Benefits management can be one way to identify the stakeholders, analyze their different requirements and prepare mechanisms how these requirements can be communicated to and realized by internal and external stakeholders.

This paper contributes to the under-researched field of IT PM in public administrations. Further research needs to be done concerning the implementation process of IT PM. Mechanisms which support the stable use of IT PM in the public sector need to be found, too. Moreover, benefits for different stakeholders by using IT PM as decision-making instrument need to be identified by conducting case studies or empirical research. The existing case studies need to be analyzed in more depth so that recommendations can be given on how IT PM needs to be designed in a public sector context. Further, it needs to be analyzed if an overall IT PM which covers all governmental departments is possible or sensible as each department has its own professional focus. This fact also affects the use of IT, e.g. the need for special information systems. This heterogeneity in the IT landscape makes an overall IT PM more challenging.

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Value Proposition in Mobile Government

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Abstract. This paper aims at providing an integrated framework and process for identifying and assessing values in mobile government applications. Value proposition with related management issues of offering and delivering mobile government services to citizens, businesses, and government agencies are described and discussed. Based on a business model perspective, we further specify and structurally link constituents, values, services, and indicators for mobile government systems. The proposed approach and results could be valuable for adoption to guide the planning and evaluation of value-centric mobile government strategies and projects.

Keywords: Value proposition, mobile government, mobile services, business model.

1 Introduction

Electronic government (e-government, EG) aims at delivering public services to citizens and businesses, leveraging internal productivities of government agencies, and integrating service systems across government organizations by adopting and using information and communication technologies (ICTs) in innovative ways. Mobile government (m-government, MG), with the adoption of mobile technologies, refers to a functional extension of e-government that enables citizens, businesses, and government employees to access government information and services via mobile devices [24]. While ubiquitous government (u-government, UG) emphasizes on the new form of interactions and transactions that are possibly operated anywhere, at any time, and on various devices and networks due to the utilization of ubiquitous technologies [3]. The same as for e-government, proposing values to all stakeholders including citizens, businesses, and government agencies have been regarded as a key success factor for promoting the development and use of mobile and ubiquitous government services. Therefore, value proposition and value creation are considered as major objectives and central tasks for the deployment and management of MG/UG related strategies and systems. For simplicity, we use m-government to cover both MG and UG characteristics in the subsequent discussions. On the other hand, business models (BMs) have been noted as proper means to illustrate the concepts and methods for value proposition in both e-business and e-government domains [7,13,18,23,28]. In general, business models focus on specifying structural components and

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 175–187, 2013.

relationships such as actors, services, value, activities, and communications for directing business operations. Therefore, to design and develop suitable EG business model is a key to facilitate value proposition and sustain continuous operations of EG services. Likewise, designing and operating mobile-characterized business models are critical to the success in promoting the provision and usage of MG services, as well as in achieving the goals of proposing and creating public value. In the literature, the emerging issues regarding value proposition and business modeling for e-government and m-government have increasingly attracted research attentions in the past few years. Yet, a unified view and an integrated framework towards illustrating the concepts and methodologies for value proposition and business modeling are still lacking. As a result, the demand of a comprehensive study in this field is significant and strong.

In the literature of e-government applications, various research attempts have proposed some views for identifying value. For instance, identified EG related value include citizen value, business value, employee value, organization value, service chain value, administration value, society value and nation value [28]. While focusing on the mobile commerce domain, among very limited research works, one approach of value proposition characterizes business value into three major themes including ubiquitous access, productivity enabler, and positive image [10]. Overall proposed value includes instant access, emergency use, enhanced anytime access to new services, and increased productivity. When targeting on the m-government domain, the shortfall of research works dealing with value proposition issues are even more severe. Research literature in this area is very limited and lacks of in-depth investigations. Therefore, the goal of this paper is to propose an integrated conceptual framework for identifying and proposing value to fit the m-government applications. Value proposition with related management issues for providing and delivering mobile public services to citizens, businesses, and government agencies are to be described and discussed. Based on an adaptable EG/MG business model perspective, value, constituents, services, and indicators for MG systems are specified and structurally presented. The proposed value-centric BM framework can then be used to support the planning and evaluation of MG related strategies and systems. The rest of this paper is organized as follows. In section 2, a brief literature review on MG related value is provided. In section 3, an integrated framework is presented with specified value dimensions and elements. In section 4, MG related value, constituents, services, and indicators are illustrated based on a value-centric BM perspective. Concluding remarks and discussions are provided in the final section.

2 Literature Review

Since previous works focused on value proposition for mobile government are very limited, brief reviews of the research literature regarding value proposition in e-business and e-government, as well as in m-commerce and m-government domains are provided in this section to show the current research status and critical issues.

2.1 Value Proposition in E-Business and E-Government

Value, in general, refers to benefits or simply convenience a technology or service affords the end user, and value proposition is an equation of the all positive factors that interest the individual [20]. Value proposition identifies how the supplier fulfills the customer's needs across different consumer roles, and further specifies the interdependence between the performance attributes of products or services and the fulfillment of needs [6].

In the e-business domain, issues of value proposition and creation have been discussed from various business perspectives including enterprise, customer, supply chain, and markets. Value types identified by previous works include business value, customer value, product value, service value, relationship value, supply chain value, etc. Value assessment is carried out by using a set of financial and non-monetary measures. For instances, commonly mentioned value in the e-business literature include profit gains, cost savings, brand awareness, customer loyalty, etc for business companies, and time efficiency, location convenience, price deduction, customization and personalization, security and privacy protection, etc for customers.

In the e-government literature, although creating value for citizens, government agencies organizational institutions, and other stakeholders has been considered critical to the success of EG strategies and initiatives, there are only very few works comprehensively addressing value proposition, creation and assessment issues [4,11,14,18]. Among the works for developing value related framework, Grimsley and Meehan (2007) propose an evaluative design framework for EG information system projects in which well-informedness, personal control, and influence are adopted as evaluative measures for public satisfaction and trust [9]. Yu (2008) presents a value-centric EG service framework that encompasses four balanced scorecard (BSC) based dimensions for managing respectively citizen and business value, government employee and organization value, service chain, institution and administration value, as well as society and nation value [28]. Badri and Alshare (2008) present an EG business value model that comprises six dimensions including IT capability, search and transaction-oriented uses of EG, intelligence generation, new business development, time savings, and firm profitability [4]. Prakash, Jaiswal, and Gulla (2009) suggest using a conceptual framework with three key dimensions including constituent service, productivity, and political consideration for assessing public value in terms of dimension associated value indicators [19]. Hossain et al (2011), through investigating the impact of organizational assimilation of EG systems on business value creation, operationalize the measure of EG system value in three dimensions including organizational efficiency, operational transparency, and public satisfaction [11]. Panagiotopoulos et al (2012), for analyzing and evaluating ICTs in public engagement, apply a business model perspective that consists of four dimensions including value proposition (effects), value network (actors), value architecture (resources), and value finance (costs) [18]. The value proposition is to describe the decision stages, activities, and tools, the intended benefits and effects, as well as the audience engagement.

It can be seen that since issues of value identification, proposition, assessment, and creation regarding e-business and e-government applications are largely unexplored and no consensus exists in views and structures about value, more research efforts in the direction of developing framework and metrics for defining and depicting value in both the e-business and e-government domains are strongly demanded.

2.2 Value Proposition in M-Commerce and M-Government

Mobile services refer to information, communication, and transaction services that are accessed and delivered via mobile communications networks. Mobile services are often classified into different categories by using different perspectives. For instances, m-services can be categorized into m-communications services, m-information services, m-transaction services, m-entertainment services, and m-community services etc by service types, into m-commerce services, and m-government services by service sectors and environments, or into m-tourism services, m-healthcare services, m-learning services, m-auction services, m-agriculture services, m-emergency services, and mobile law enforcement services etc by application domains [1,2,35,6,12,15,16, 17,21,22,24,25,26]. Specific characteristics and features of m-services often mentioned include mobility, convenience, portability, adaptivity, ubiquity, personalization, localization, broadcasting, and security etc. Players involved in the mobile service chain include mobile service providers, mobile content providers, service and content aggregators, mobile device providers, mobile gateway and interface providers, and mobile network operators, etc. As mobile devices become more powerful and affordable, and more mobile services and apps are available and accessible, the goal of proposing and creating value for mobile applications becomes more achievable. In the literature, there are a plenty of previous works addressing applications and impacts of m-services in both the business and government sectors. However, there are still very few research efforts sufficiently examining the structure and process of value proposition in the mobile application domain. The lack of a unified view for value proposition of mobile services and systems is also significant.

Among research works related to mobile commerce value, Clarke III (2001) considers value proposition as a means to engender a productive m-commerce strategy, and specifies four dimensions including ubiquity, convenience, localization, and personalization to gain advantages [6]. By defining value proposition of mobile applications as the net value of the benefits and costs associated with the adoption and adaptation of mobile applications, Nah, Siau, and Sheng (2005) adopt a value-focused thinking approach to build a means-ends objective network that depicts the causal relationships among value-converted fundamental and means objectives. Six most important fundamental objectives identified are efficiency, effectiveness, customer satisfaction, security, cost, and employee acceptance [16]. Through investigating industrial experts' perception of characteristics and value for mobile information systems, Hoehle and Scornavacca (2008) identify three major themes for value proposition including ubiquitous access, productivity enabler, and positive image [10]. Emphasizing that value proposition to customers and the balance between

privacy, value, and control are keys to the acceptance of mobile technologies and services, Renegar, Michael, and Michael (2008) identify convenience, location-based services, time saving, better tracking, cost reduction, security enhancement, as well as lower prices and special promotions as the m-business value [20]. Focusing on defining m-commerce services and business models, Varshney (2008) described overall value proposed to mobile customers in terms of instant access, emergency use, enhanced anytime access to new services, and increased productivity. He also points out that required functions for facilitating m-commerce services are location management, real-time delivery or service quality, transaction support, security, and wireless network reliability [25]. Focusing on the improvement of user-centric m-commerce services effectiveness, Germanakos et al. (2008) identify personalization, localization and immediacy as three dimensions for the mobile marketplace that provides services including text-based short message services (SMS), multimedia message services (MMS), and location-based services (LBS) [8].

As for value related works in the mobile government literature, Anttiroiko (2005) argues that the ultimate goal of introducing u-government is to generate added value from the point of view of individuals and society as a whole [3]. He considers value as benefits related to the overall performance of public administration, such as increased productivity and effectiveness, smooth internal operations and inter-organizational interactions, better service delivery, and multiple channels for interaction. He also classifies public u-services with added value into a variety of application areas including travel and transportation, public service directories, registrations and permits, access and support, etc. Trimi and Sheng (2008), based on reviewing MG initiatives in several leading countries, consider MG as value-added EG with advantages in various aspects [24]. These advantages include improving the delivery of government information and services, providing best solutions to Internet connectivity problems and digital divide issues, offering a more cost-effective choice for national networking, helping to avoid problems of corruption and low productivity, as well as increasing government employees' efficiency and effectiveness. Most MG applications implemented are in the segments of G2C (government to citizen) and IEE (internal efficiency and effectiveness). For example, m-G2C services include government information access, text message alerts, GPS-based traffic guides, mobile tax and fee payments, and electronic ID card. M-IEE services include internal communications, in-vehicle access to crime databases for police officers, on-the-spot information processing for field inspections, tracking task assignments to workers, parking/traffic monitoring, and tax management. Ntalinai, Costopoulou, and Karetsos (2008) present a framework for introducing agricultural mobile G2B (government to business) services [17]. The generic agricultural m-G2B information and interaction services include news and policy, notification and alerts, forecasts and consulting, petitions and financial transactions, search engine and employment market, polls and forums, etc. The benefits for using the MG services are mobility and ubiquity, provision of location-based government services, time saving, on-time information delivery, ease of use, and improving emergency management. For addressing the acceptance issues of MG services, Aloudat and Michael (2011) [2], and Hu et al (2011) [12], focus in emergency and law enforcement applications respectively. Factors considered in the former study

include trust, perceived risk, perceived usefulness, perceived ease of use, visibility, perceived service quality, perceived currency, perceived accuracy, perceived responsiveness, privacy concerns, data collection concerns, and the concern of unauthorized use, while in the latter study, factors tested include efficiency gain, timely assistance, social influence, perceived usefulness, perceived ease of use, and facilitating conditions. Yan, Zhang, and Zhang (2012), provide a value analysis framework with three stages including characteristics, innovation and changes, and value for illustrating the path of MG value generation [27]. Value identified include narrow digital divide, reduce management granularity, instant response, custom personal service, initiative delivery, on-spot management and service, low cost, and high efficiency. Berg et al (2013), targeting on cellular citizenship, report the usage of GPS-enabled smartphones as nation-wide real-time data collection mechanisms in developing countries [5]. The system is developed to support policy makers and planners of both the local and national levels in monitoring, assessing, and arranging human and material resources. The goal is to enhance government accountability by improving transparency in decision making and resource allocation, while increasing local planning capacity and ownership.

By reviewing research issues regarding value proposition, we summarize that previous research works address EG/MG value only partially and with inconsistent views. There is neither unified view nor complete and commonly accepted conceptual framework for illustrating the integrated structure of value proposition. It can also be noted that value proposition is a central strategic task and critical success factor in the planning and implementation of EG/MG services, value proposed to EG/MG stakeholders should be included as core elements of business models, and value associated metrics and indicators is the basis of EG/MG performance measurement. Since research in the literature addressing MG value proposition is still in its initial stage, more comprehensive studies and in-depth discussions are needed.

3 Integrated Framework for MG Value Proposition

To be specific, value can be considered as tangible and intangible benefits of products and/or services perceived by and exchanged between stakeholders. Then, value proposition is to propose a set of value to specific stakeholders with an implicit or explicit promise that the proposed value is to be created for and delivered to them. Many researchers consider MG as value-added EG with advantages and benefits to individuals, governments, and society [3,24]. Therefore, for better understanding value proposition issues of MG services and systems, characteristics of the added value to MG services, types of delivered MG services that create value, and constituents who provide and/or use MG services to gain benefits must be realized. By doing content analysis from previous studies, as well as taking into account value chain management and business modeling concepts and methodologies, we develop an integrated framework with three dimensions including functional features, user acceptance, and user benefits, for classifying MG related value. User benefits are further classified into four constituent categories, namely, public beneficiaries,

government officers and employees, participating parties of the government service chain, as well as society and nation as a whole. Figure 1 depicts the conceptual framework for value proposition in mobile government. Value dimensions and associated elements are described in the following sub-sections.

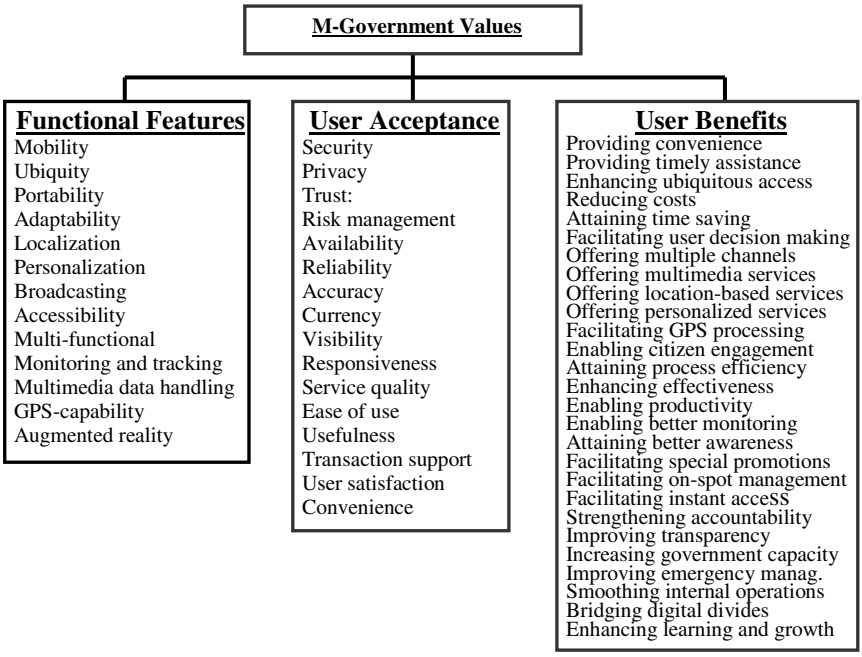

Fig. 1. Conceptual framework for MG value proposition

3.1 Functional Features of MG Services

Functional features of MG services refer to the characteristics of enhanced and enabled functions that reveal added values of the m-government services. These MG functional features include mobility [17], ubiquity [6,10,17,24,25], portability [10], adaptability [19], personalization [6,8,10], localization/location management [6,8,17,20,25], broadcasting, accessibility [8,10,24,25], multi-functional [5,10], monitoring and tracking [20,24], multimedia data handling [8], GPS-capability [5], and augmented reality (http://mobilegovwiki.howto.gov/Augmented+Reality).

Mobility: Users can get access to mobile services independent of location and time by using mobile devices.

Ubiquity: Mobile services are available 24x7 and can be accessed at anytime and anywhere with multi-channel connections.

Portability: Mobile devices are easy to be carried around and can always be connected for accessing mobile services via any mobile communications networks.

Adaptability: Mobile services and applications can be adapted to users' environment such as device types, network bandwidth, and locations.

Localization: The capability to locate mobile users at any particular moment and to offer location-based information and services.

Personalization: Mobile services and applications are tailored to meet users' needs, preferences, conditions, and environments.

Broadcasting: Information can be delivered simultaneously to all mobile users within a specific geographical region.

Accessibility: Anyone can easily access government information and services with the mobile devices.

Multi-functional: Many different functions such as search, communication, community, multimedia data processing etc are integrated in the mobile devices.

Monitoring and tracking: Data and entities can be monitored and tracked for controlling status changes.

Multimedia data handling: Text, image, audio and video data can be handled using the same mobile device.

GPS-capability: Geo-referred data can be collected and presented.

Augmented reality: Multimedia information about the environment and its objects can be overlaid on the real world.

3.2 User Acceptance Levels of MG Services

User acceptance levels of MG services refer to the user perceived value of the m-government services and technology that reinforce their intention to use. These factors include security enhancement [2,10,16,20,25], user satisfaction [16], privacy protection [2,20], service quality [2,25], transaction support [12,25], system reliability. [25], ease of use [12,17], usefulness [2,12], trust [2], risk management [2], visibility [2], currency [2], accuracy [2[, and responsiveness [2,27].

Security: The ability to ensure data and system integrity, as well as to prevent, detect, and control security attacks such as repudiation and intrusion in MG environments.

Privacy: The ability to ensure that access to user accounts is restricted to authorized individuals and that the private user information is protected from unauthorized use.

Trust: The ability to ensure that mobile users are well-informed, information is accurate, transactions are secure, and systems are reliable.

Risk management: The ability to handle analysis, prevention, and recovery tasks regarding risk events in the MG environment.

Availability: The ability to ensure that information, information accessing channels, m-service functions and systems are available when requested.

Reliability: The ability to ensure that mobile services, systems as well as outcomes are consistent and accurate, and are dependably and continuously operated.

Accuracy: The ability to ensure that data and information are accurate.

Currency: The ability to maintain the up-to-date data and ensure timely information.

Visibility: The ability to make the mobile service process visible to the users.

Responsiveness: The ability to quickly respond to user requests and transactions.

Service quality: The ability to assure high quality of delivered m-services.

Ease of use: The easiness in accessing and using m-services with the provision of friendly user interfaces and mechanisms.

Usefulness: The m-services are perceived useful to the users.

Transaction support: The ability to support users in conducting mobile transactions.

User satisfaction: The ability to satisfy users with proper information and services.

Convenience: Mobile services can be accessed by users anytime and anywhere.

3.3 User Benefits of MG Services

User benefits of MG services refer to value as benefits that are to be created and delivered to users. Based on the functional features and technological capabilities of the MG services, user benefits to various constituent groups include the followings.

Providing convenience in using the m-government services and systems [6,20].
Providing timely assistance and transaction support to users [12].
Enhancing ubiquitous access to information and services [10,24,25].
Reducing costs in developing, operating, and using m-government services [16,20,24].
Attaining time saving in the m-government services process [17,20].
Facilitating user decision making process and enhancing effectiveness [24].
Offering multiple channels for two-way user-government interactions [3].
Offering more multimedia services for m-government users [8].
Offering more location-based services for m-government users [8,17,20,27].
Offering more personalized services for m-government users [6,8,10,27].
Facilitating GPS-enabled data and maps processing [5,24].
Enabling citizen engagement and increasing social influence [12].
Attaining high process efficiency in accessing and delivering m-government services [3,12,16,17,24,27].
Enhancing management effectiveness for local and central governments [3,8,16,24,27].
Enabling productivity in different sectors and levels of government agencies [3,10,24,25].
Enabling better monitoring, tracking, and control of data management and services delivery processes [5,20,24].
Attaining better awareness and positive image for government [10].
Facilitating special promotions of government activities [20].
Facilitating on-spot and location management of data and events [25,27].
Facilitating instant and/or real-time data collection, information access, service delivery, and transaction response [5,8,17,24,25,27].
Strengthening government accountability and reducing management granularity [5,27].
Improving transparency in service delivery and decision making [5].
Increasing local government capacity in planning, operation, and control [5].
Improving emergency use and management of government resources [17,25].
Smoothing internal operations and inter-organizational interactions [3].

Bridging/Narrowing domestic and international digital divides [24,27].
Enhancing equal digital opportunities and nation wide learning and growth [28].

4 Business Model Perspective for MG Value Proposition

In this section, value proposed to m-government users as benefits are to be classified into four constituent groups based on a business model perspective. With the BM perspective, services, constituents, value, strategic objectives, and performance indicators related to MG systems can be structurally linked and presented. By adapting a value-centric business model with the balanced scorecard perspectives provided by Yu (2008), the four BSC-BM perspectives for MG include public beneficiaries, government internal organization and process, government service chain, as well as society and nation [28]. In the public beneficiaries perspective, the constituents include citizens, businesses, and NGOs, the value types include citizen value, business value, and NGO value, the value elements are constituent specific benefits derived from previous sections. Strategic objectives of MG services for this group are specified goals transformed from the value elements (i.e. constituent benefits) associated with this constituent group. The value-added MG services are provided in the m-G2C and m-G2B systems. The value indicators for performance measurement can then be specified accordingly. The constituent groups and associated value of the other three value-centric BSC-BM perspectives include the government officers and employees with employee value and organization value in the government internal organization and process perspective, the participating parties of the government service chain with service chain value for the entire chain and all participating parties in the government service chain perspective, as well as the society and nation as a whole with society value and nation value in the society and nation perspective. Figure 2 illustrates the BSC-BM based MG value proposition model.

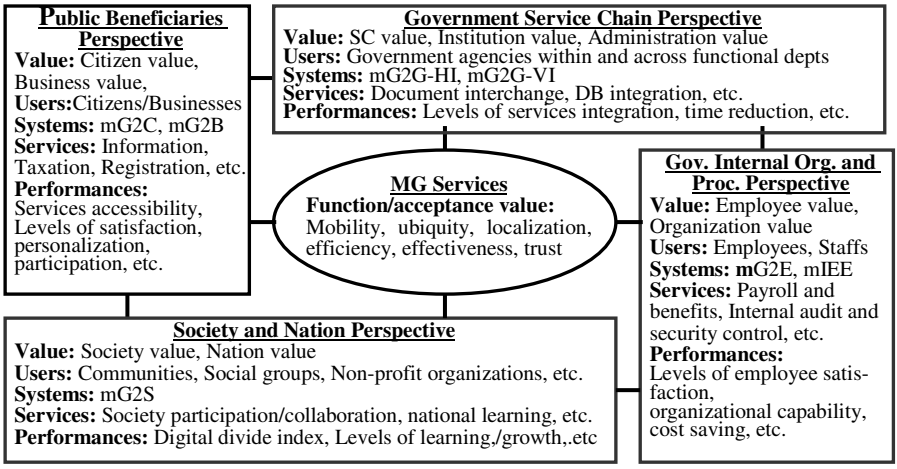

Fig. 2. Value proposition model based on BSC-BM perspectives

Example m-G2C services include (1) mobile information services for accessing government information about news, weather, traffic, tourism, healthcare, and jobs, (2) mobile notification and alert services for sending text message alerts and reminders about emergency conditions, tax payments, and others, (3) mobile transaction services for conducting tax and fee payments, (4) location-based services for accessing GPS-enabled tour guides and road maps, (5) mobile community services for connecting people and authorities, as well as sharing knowledge and real-time information, (6) other m-services such as personalized, collaborative, and participative services.

5 Concluding Remarks and Discussions

In this paper, we propose an integrated framework with three dimensions including functional features, user acceptance, and user benefits for value proposition in m-government. We then use BSC based business model perspectives to classify user benefits into four constituent categories, namely, public beneficiaries, government officers and employees, participating parties of the government service chain, as well as society and nation as a whole. Value, users, systems, services, and performance indicators for each group are structurally presented. The contribution and implications of this paper are twofold. By using the proposed value framework and business model, MG planners can firstly select proper value elements from three dimensions to effectively enable m-services functions, assure user acceptance, and generate user benefits, and can secondly develop and implement MG related strategies and action plans, as well as evaluate corresponding performances based on the four BSC-BM perspectives. Furthermore, the framework is rather complete and flexible to cover previous and support future cases of MG value proposition. Directions of future research include validating the proposed MG value framework and associated indicators by conducting interviews, focus group discussions, and case studies, as well as adopting the value-centric BSC-BM for real case operation and evaluation.

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A Framework for Interoperability Testing in Pan-European Public Service Provision

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Abstract. A major challenge of interoperability projects and initiatives is to validate that different implementations work together and are compliant with underlying standard specifications. Interoperability testing can ensure that required end-to-end functionality is adequately fulfilled and all systems are implemented in conformity with existing standards. Adopters of standards have different methods to prove fulfillment of interoperability requirements. This often results in different efficiency, different quality and a lack of conformity. In this paper, we present the interoperability testing framework used in PEPPOL (Pan-European Public Procurement Online). The framework has supported the project well in establishing various production pilots that interoperate together in the field of e-procurement. It thereby aggregates different testing perspectives ranging from conformance testing to compliance testing and provides guidelines how to prove implementations through testing scenarios. Consequently, the key research question in this paper is how interoperability initiatives can prove that different implementations are compliant with underlying standard specifications and how interoperability can be ensured among different implementations beyond the technical approval mechanisms provided through conformance testing.

Keywords: Pan-European Public Service Provision, Interoperability Testing, Conformance Testing, Compliance Testing, Public E-Procurement.

1 Introduction

Interoperability projects and initiatives often face the problem that sector specific scenarios are widely adopted by users, but the establishment of interoperability between various communities and implementations still remains cumbersome. Several authors have emphasized that greater interoperability within and across private and public sector entities could be achieved when more advanced testing methodologies and practices are used. Common guidelines for interoperability testing could foster standards adoption and could help to achieve better conformance and compliance with the underlying standards, specifications and agreements. They increase overall coherence, consistency and quality of standards and provide active support to their implementation. At the same time the risk of fragmentation, duplication and conflicting testing efforts could be reduced [1,2].

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 188–199, 2013.

Most authors agree that interoperability can be described upon basic characteristics which can be generally described as the ability of different ICT systems to communicate and interact with each other as well as to exchange information [5,6]. Conformance testing can be used to prove the ability of ICT system to communicate and interact together as it describes the process for verifying that an implementation of a specification fulfills its requirements both in terms of choreography of collaborations and in terms of information constraints on information elements[1]. Nevertheless there are broader definitions of interoperability which also refer to the ability of organizations to co-operate seamlessly on the basis of common processes, business rules and agreements [8]. According to the European Interoperability Framework (EIF) interoperable specifications shall address legal, organizational, semantic and technical aspects of a business process. Although the development of European public services mostly includes the exchange of data between ICT systems, interoperability can be understood as a wider concept, encompassing for example the ability of private and public sector entities to work together towards mutually agreed goals which are beneficial to all parties involved [3]. Taking this wider interoperability scope into account, it seems obvious that conformance testing cannot be the only means to test interoperability. In fact conformance testing can be seen as a prerequisite for interoperability testing. Interoperability testing is executed by operating implementations enforcing them to interoperate following a specific behavior [1] and thereby addressing testing activities on legal, organizational, semantic and technical level.

Interoperability testing provides a wider scope than conformance testing as it also describes methods, processes and tools that are required by adopters to claim compliance. This not only includes the technical process of testing the conformance of document instances but also the proof that agreements are singed or legal perspectives of a system have been considered correctly during the implementation process. Interoperability testing therefore has to define a wider set of activities to ensure that systems work properly together. This paper subsequently investigates theories and related work on conformance and compliance testing in section 2. Thereby, the differences between conformance and compliance testing as well as how both fulfill a distinct need in the interoperability testing are argued. The interoperability testing framework used to support the implementation of PEPPOL building blocks through conformance and compliance testing methods is presented in section 3. The methods were aggregated to a framework to prove components against the PEPPOL specifications and agreements. While conformance testing is a well-known method in standards implementation and technical approval it does not cover all aspects required to ensure interoperability on an organizational, semantic and legal level in complex environments. The paper therefore concentrates on the use of compliance testing methods. Section 4 exemplifies the use of the framework and its testing methods in the context of the Virtual Company Dossier (VCD), a PEPPOL building block for electronic tendering. A number of guidelines, scenarios and underlying specifications

[1] CEN Workshop Agreement (CWA 16073-1): Report on Requirements: Conformance and interoperability testing. European Committee for Standardization, Brussels (2010).

clarify how the framework was practically implemented in the project. The conclusions in section 5 assess the benefits of a coordinated interoperability testing approach and make suggestions for further research directions.

2 Theories and Related Work

The major elements relevant to interoperability testing are conformance texting and compliance testing. In conformance testing, a specification comprises all agreements done by a community in particular the underlying standards or profiles, which represent subsets or interpretations of that specification. From an architectural perspective, agreed specifications can be described as follows:

> *Profiles* describe specific parts of a process, where bilateral (or multilateral) communications are executed. Together they form the interfaces of that process apart from internal or back-office logic. A *process* consists of collaborations, which define the choreography of transactions between parties. These parties may exchange documents (e.g. a XML message) among each other. Each *document instance* refers to an underlying transaction data model defined in the profile. *Transaction data models* consist of several *information elements,* which may be further restricted through information constraints. An implementation of such a data model may require to be tested against the data model to proof its conformance. Conformance testing describes the process for verifying that an implementation of a specification fulfills the requirements of the profile, both in terms of choreography of collaborations and in terms of information constraints on information elements[1].

According to Gebase et al. [4] conformance testing is a black-box test, where the tester has no knowledge about the structure and code of the implementation. The testing environment, which aggregates the test capabilities, is named test bed. The test bed consists of a set of test assertions, which formally define the requirements or information constraints to be tested. Test assertions are intended to define constraints such as the existence or value of information elements. They may also describe cases, where a value depends on another value, a function or a code list[1]. Validators and validation artifacts such as the underlying XML-Schema, Code Lists or Schematron files are summarized within the test bed and they identify, whether a given document instance or test item complies with the defined requirements. Conformance testing may be executed through valid and invalid test items, which are sent to the test bed and thereby tested against the test assertions using the validation components of the test bed. The result is the divergence of the test item to the underlying specification or standard. Invalid test items are often used to test the validation component itself [1,4].

In the context of interoperability testing, conformance testing can be seen as a prerequisite for interoperability testing. Interoperability testing shall ensure that different systems work together on all levels. Interoperability testing is executed by operating implementations enforcing them to interoperate following a specific behavior [4]. Ivezic et al. describe interoperability testing as the process for verifying that several implementations can interoperate together while conforming to one or more specifications [1]. The authors remark that conformance testing does not guarantee interoperability and that in turn interoperability testing does not substitute the conformance testing. In fact, interope-

rability testing is usually more cost-intensive than conformance testing, since time and human efforts have to be spent in order to coordinate and set up an appropriate environment for interoperability testing. However, interoperability testing is usually more successful and less costly when the conformance of implementations has been tested first. Thus interoperability testing can largely benefit from conformance testing [1].

The term compliance testing summarizes methods beyond conformance testing, focusing on legal and organizational aspects. All relevant methods are aggregated within the interoperability testing framework, which was conceptualized in the PEPPOL project. While the aspects of conformance were rather clear during the conceptualization, compliance testing had an unclear scope with less approaches and guidelines available. Conformance testing deals with the technical and syntactic interoperability on established standards such as XML, while covering certain semantic aspects at the same time (e.g. multilingual code list values). Thus for semantic interoperability there are some concepts and methods available, but for legal and organizational interoperability, it is by far less obvious how a standardized concept and method could look like for compliance testing, and who could develop and establish appropriate standards [7]. The paper at hand contributes to clarify and structure the full scope of interoperability testing beyond the more technically-oriented conformance testing. The next section presents the framework for interoperability testing as developed in PEPPOL.

3 A Framework for Interoperability Testing

The framework for interoperability testing provides a structured approach of testing software distributions. It can be used to verify that implementations comply with specifications and requirements. It also ensures that systems considering legal and organizational cross-border aspects are appropriate. Figure 1 depicts the overall framework for interoperability testing, distinguishing main test groups and specific test types that define the outline of test executions.

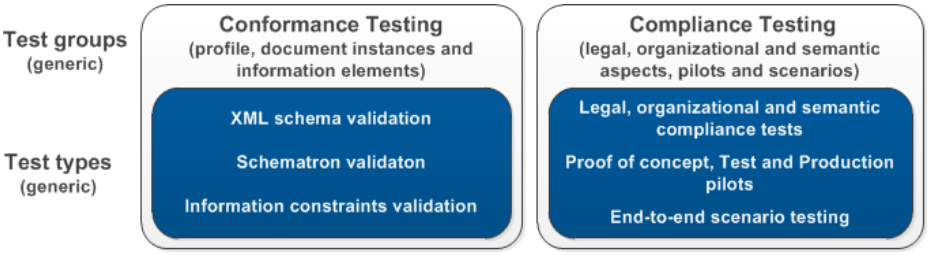

Fig. 1. Test groups and test types of the framework for interoperability testing

Conformance Testing ensures that software components are able to generate and understand correct document instances. Compliance testing is particularly used to verify that legal, organizational and semantic aspects are correctly implemented. It thereby focusses on common denominators across all implementations such as the use and testing of central components as well as the execution of end-to-end tests between implementations and pilots. While compliance testing focuses on a domain specific range of issues relevant to a process (e.g. legal and organizational peculiarities,

agreements, central service provision), conformance testing strictly focuses on the adherence to a standard. Both test groups are detailed subsequently.

3.1 Conformance Testing

The aim of conformance testing is to test whether software components are able to generate and understand correct document instances. Document instances in the PEPPOL VCD context are correct if they are valid along the aspects listed in table 1.

Table 1. Validation aspects of VCD conformance testing

Aspect	Description
Document structure	Correctness of the structure and data elements of an XML instance as defined in the corresponding XML schema
Element cardinalities	Optional elements MAY exist, mandatory elements MUST exist. Prohibited elements will not be part of a profile XML schema. — 0..1 = optional, zero or one occurrence — 0..*= optional, zero or more occurrences — 1 = mandatory, one occurrence — 1..* = mandatory, one or more occurrences
Data types	String, integer, float, date, time, Boolean
Value ranges	— Length (for elements of type string) — Range (for elements of types integer, float, date and time)
CodeLists	Correct use of values as defined in CodeLists
References	— Correct file references in a document — Existence of VCD sub folders for economic operators defined in the VCD Package meta-data file. — Correct element references.
Value patterns	Correct values and format of specific element values, e.g. UUID: random UUID; Date: yyyy-mm-dd; Time: hh:mm:ss

Table 2 describes the different test types of conformance testing, which cover the validation aspects listed above.

Table 2. Conformance test types

Test type	Description	Rationale	Validation artefacts
XML schema validation	XML schema validation of document instances against the specified XML schemas.	As a minimum requirement of validation, document instances have to conform to an XML schema.	XML schema files: Define the technical structure of a document instance, including allowed elements, cardinalities, data types and value ranges.

Table 2. (continued)

Schematron validation	Schematron validation of document instances against Schematron rules.	Used for additional validation against rules not covered by the basic schema validation.	Schematron files: Define Schematron validation rules
Information constraints validation	Validation of document instances against additional information constraints derived from business rules.	It is necessary to test such constraints that cannot be covered by XML schema and Schematron validation, e.g. file references within an XML instance.	Context value associations (CVA) files: Express the relationship between controlled vocabularies (e.g. CodeLists) and document elements. Test System rule definition: Define validation rules for a Test System.

Figure 2 illustrates the phases of the conformance testing methodology. These steps allow a structured and organized testing of document instances.

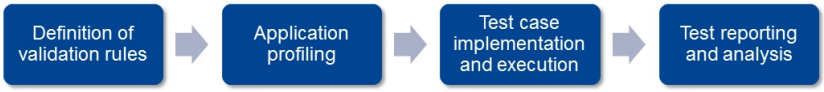

Fig. 2. Conformance testing phases

The first phase covers the definition of validation requirements, business rules and information constraints that define the rules and constraints against which document instances are being validated. In order to prepare the application profiling phase, all relevant requirements and rules have to be formally defined through a schema profiling tool (e.g. SchemaProf[2]). Application profiles provide the technical basis for implementing the tests. The step of application profiling shall lead to a concrete set of test system configurations that can be processed by validation software. For the actual testing of document instances, each application profile has to be implemented as a test system. A Test System is a tool, which allows configuring test systems. It provides an executable file, through which the validation process can be started through a document instance of the test object. A detailed report is generated by the Test System after the test execution [2]. The results of test runs have to be documented in a common way. Hence, test protocols need to be created for the different test executions, and these protocols have to be stored in a central place. Test case management software (e.g. pDAF[3]) supports users to define common test cases and test tracks as well as to report and document executions and results.

[2] http://iwm.uni-koblenz.de/schemaprof/
[3] http://peppol.phloc.com/

3.2 Compliance Testing

In practice, the terms compliance and conformance are often conflated. Compliance testing means checking the behavior of a system at runtime to determine, if it behaves as desired. In contrast, conformance testing describes the ability to operate in the way defined by a specification or more precisely to test whether software components are able to generate and understand correct document instances. To make specifications suitable for implementation and interoperation, they often require to be amended through further agreements and interpretations, thus reflecting specific issues of countries and/or communities. In public procurement many processes are complex due to their legal nature. Standard specifications may reduce/exclude certain complexity aspects by assuming that an adopter/community will interpret the specifications (e.g. by defining code list and IDs) and manage varying practices in legislations (e.g. binding legal use of certified copies vs. scanned copies) correctly. In consequence, compliance testing has to focus on common specifications, their interpretation and agreements beyond the document and process level targeted by conformance testing. The framework for interoperability testing introduced in figure 1 therefore defines several compliance test types. Table 3 explains these elements by describing test types, the description and rationale of the test type and respective validation artifacts.

Table 3. Compliance test types

Test type	Description and Rational	Validation artefacts
Legal organisational and semantic compliance testing	Describes whether components fulfil the agreed specified legal, organizational and semantic behaviour. Obligatory legal, organisational and semantic rules and logic need to be checked in order to determine whether systems adequately comply with underlying legislation and organizational practices.	Document instances: Document instances are used to validate whether they comply with underlying legal, organizational and semantic requirements. Test Cases Appropriate test cases define representative or exceptional behaviour in certain legal, semantic and organisational aspects (depending on what to test).
Proof of Concept, Test and Production pilots[4]	Pilots with increasing complexity are used to specifically address legal, organisational, semantic and technical issues in a narrow and artificial setup. Proof of concept and test pilots are used to determine how the system behaves with real data but artificial set-up.	Pilots: Pilots are selected and complexity is raised gradually in order to convey the pilot from Proof of concept pilot (narrow set up) and test pilot (real data/artificial process) into productive pilot environment (real data/real process).
End-to-end scenario testing	End-to-end scenario testing emphasises on the integration among systems, applications and pilots to test system dependencies. The focus of end-to-end testing scenarios lies on interfaces and dependencies between pilots.	Scenarios: End-to end scenarios ensure to test the fully integrated pilots together and to check that they act as a whole. Different pilots may be combined to build a scenario for end-to-end testing.

[4] CEN Workshop Agreement (CWA 16073-4): Part 4: Evaluation guidelines for testing and piloting. European Committee for Standardization, Brussels (2010).

One could argue that the distinction between system testing and compliance testing is rather unclear since both of them focus on functional and non-functional aspects of a system. The distinction in PEPPOL was done on the basis of system dependencies and what systems shall have in common according to the PEPPOL specifications and agreements. This may include obligatory interfaces or a commonly agreed legal, organizational and semantic behavior of a system. Two further issues shall be denoted at this point: (1) Legal and organizational requirements underlie frequent changes, which result from modifications of national or European legislations. Legislative modifications therefore have to be closely monitored, and changes have to be implemented and tested in accordance with these modification. (2) Central components that are interfaced to many pilots or implementations also take a specific role. Responsibilities and liabilities for testing these central components have to be defined, since these components are typically used by all or many pilot implementations.

In summary major elements of compliance testing are the adequate fulfillment of legal, organizational and semantic requirements, the smooth conversion of implementations into productive environments and the testing of pilots, systems and components in cooperation raising the complexity of the business process gradually.

4 Exemplifying Conformance Testing with PEPPOL VCD

The PEPPOL project addresses the development and implementation of technology standards to align business processes for electronic public procurement across Europe. PEPPOL's vision is to enable businesses to communicate electronically with any governmental institution in Europe for executing public procurements. PEPPOL has developed standards-based components and tools to support interoperable e-procurement in different stages of the value chain. The Virtual Company Dossier (VCD) is a component in the pre-awards stage (see e.g. [9]) and herewith serves as an example to demonstrate the underlying models of the ICT architecture and the approach to interoperability testing. PEPPOL has decided to adopt a generic Enterprise Interoperability Architecture (EIA) to organize the artifacts in a consistent and flexible way. In this paper, we rely on the structure proposed by the PEPPOL EIA[5] to reference relevant artifacts.

The Virtual Company Dossier (VCD) has been developed to address the demand for better interoperability in electronic tendering offering a standardized document container to suppliers, which can be used to submit evidences (e.g. attestations and certifications) as part of the qualification process in public procurements [9]. Several VCD implementations had to be tested against the underlying standard specifications. With the PEPPOL VCD, we subsequently demonstrate the approach to interoperability testing in the project. All procurement solutions relevant to PEPPOL have been built on the basis of standards and tools recommended by the CEN/ISSS workshop on Business Interoperability Interfaces (CEN ISSS/WS BII). The CEN/ISSS workshop has published a set of BII (Business Interoperability Interface) profiles, each of them

[5] Cicirello, C., Hayworth, M.: PEPPOL Starter Kit. Austrian Federal Ministry of Finance, Vienna (2011).

addressing a unique part of the public procurement process. A BII profile describes the choreography of the business process with a detailed description of the collaborations including roles and responsibilities. Each BII profile is referencing its business transactions to data models, which describe the core information entities on a semantic level. On a syntax level, these data models are bound to XML documents compliant with schemas from international standards such as UN/CEFACT XML and OASIS Universal Business Language 2.0. Thus a BII profile can be seen as a major reference for conformance testing as it aggregates the key requirements, agreements and standards of the underlying business process[6,7] [6,8].

The principal specifications used in PEPPOL are known as PEPPOL Business Interoperability Specifications (PEPPOL BIS). PEPPOL BIS are based on the aforementioned BII profiles and they address additional legal, organizational, semantic and technical aspects of a business process in accordance with the European Interoperability Framework (EIF). A PEPPOL Business Interoperability Specification (BIS) summarizes all amendments which are done to a CEN BII profile. A PEPPOL BIS is more specific than a BII profiles because it adds usage-specific agreements of the PEPPOL community. It also provides supporting guidelines how to implement the requirements. A PEPPOL BIS therewith details certain aspects such as the legal scope of a specification. It also adds elements such as validation rules, identifiers and code lists that have been commonly defined in PEPPOL and addresses for example dependencies with central service components. Adopters that want to comply with a PEPPOL BIS have to comply with each interoperability layer. Thus conformance with PEPPOL BIS specifications is only one aspect of interoperability testing which focuses the syntactical and technical level and the capability of applications to generate valid document instances.

So far this paper has described the range and structure of interoperability tests executed in the PEPPOL project. In the following, an overview about the set of supporting artifacts, which are provided to adopters for the establishment and testing of PEPPOL compliant interfaces and products, is given. The artifacts listed below describe the relevant outputs according to the framework for interoperability testing introduced in section 3. They can be accessed via the PEPPOL EIA[8]. As discussed before, the VCD Business Interoperability Specification (BIS) summarizes all major aspects of interoperability testing considering all levels introduced by the EIF. The VCD BIS therewith refers to the following sub-artifacts, which are related to the test types defined for conformance testing in the testing framework:

- Specification and hierarchical data model of the data format of VCD and VCD Package in the form of testable XML schemas for the VCD, VCD Package and the common VCD library (based on UBL 2.0) (available in the PEPPOL EIA under ICT Architecture -> Models and Service Components).

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[6] CEN Workshop Agreement (CWA 16073-1): Part 1: Profile overview. European Committee for Standardization, Brussels (2010).

[7] CEN Workshop Agreement (CWA 16558 – Annex A): Annex A - Profile Architecture. European Committee for Standardization, Brussels (2012).

[8] `http://www.peppol.eu/peppol_components/peppol-eia/eia`

- Specification of codes and values (incl. translations) of all VCD-related classified lists (i.e. code lists) provided as genericode files (available in the PEPPOL EIA under ICT Architecture -> Models and Service Components).
- Abstract business rules and UBL bindings for the VCD and VCD Package and the definition of rules against which VCD and VCD Package instances must be valid (available in the PEPPOL EIA under Conformance and Test -> Models).

The above mentioned artifacts are aggregated into application profiles for VCDs and VCD Packages (available in the PEPPOL EIA under Conformance and test -> Models). SchemaProf, a tool for XML based application profiling has been used to aggregate and describe all modifications described above. The application profiles are used to create correlating VCD Conformance Test System which can automatically detect variations from the aforementioned artifacts. The Conformance Test Systems are generated from application profiles and allow automatic validation of VCD Containers against the rules defined in the VCD data model as well as requirements regarding codes and values and business rules (available in the PEPPOL EIA under Conformance and test -> Service Components).

Apart from the conformance testing artifacts, a number of compliance testing artifacts have been created:

- The ontology governance process is a guideline for setting duties, roles and responsibilities for governing the legal domain ontologies and keeping the central component, the European VCD system, up to date. As all VCD implementations depend upon this central service provision component it is essential that all adopters can rely on the information source. To ensure the quality of the information source a set of ontology quality assurance tools have been developed to establish a well-functioning quality assurance process (available in the PEPPOL EIA under Conformance and test -> Models and Service Components).
- To proof representative or exceptional behavior in certain aspects a set of test case definitions have been defined. Test cases can be aggregated to test-tracks thus complexity can be raised gradually. Test cases can be used to address certain legal, organizational, semantic aspects during process executions but they can also be used for a proof of concept and pilot testing (available in the PEPPOL EIA under Conformance and test -> Models).
- Historical Call for Tenders are used to provide data to the test executions in order to build test pilots that rely on real data within an artificial process set-up (available in the PEPPOL EIA under Conformance and test -> Models).
- A guideline for Contracting Authorities describes how to pilot the VCD in real environments including sample Call for Tender and sample VCD response. Since the VCD solution depends on other tendering processes beyond PEPPOL the full scope of scenarios is analyzed and suitable conditions to build effective VCD scenarios are identified (available in the PEPPOL EIA under Marketing -> Models).

5 Discussion and Concluding Remarks

This paper introduced a generic framework for interoperability testing and exemplified its application through the PEPPOL VCD solution. Interoperability testing helps to overcome a major challenge of interoperability, i.e. it helps to validate that different implementations work together and are compliant with the underlying specifications and standards. Greater interoperability can be achieved through application of interoperability testing methods and practices to foster standards adoption. Common methods and practices increase the coherence, consistency and quality of standards, provide active support to their implementation and reduce the risk of fragmentation, duplication and conflicting testing efforts. In this respect, the paper has shown the different aspects of interoperability testing, separating clearly the concern, approach and goals of conformance testing and those of compliance testing.

The use of conformance testing and compliance testing methods in PEPPOL helped to ensure that VCD solutions co-operate seamlessly on the basis of common processes, business rules and agreements of the project. Whereas conformance testing is a well-structured process that can potentially be executed automatically on any document instance using specifically designed test systems that aggregate all test assertions, compliance testing is a less structured challenge and requires more involvement of resources for designing and executing appropriate tests for the implementation under test. Overall, conformance testing was very helpful in PEPPOL for the technical approval of the system capabilities to generate correct outputs, whereas the compliance testing covered the aspects that arise from the complexity and the intention to use the solution in cross-border scenarios. For simple transactions or services with little legal and organizational constraints involved, conformance testing might be a sufficient method for testing interoperability. Transactions in complex environments with many legal risks, organizational dependencies and multilingual requirements require stronger control and specifically designed test techniques to assure proper implementation and reliability. Within the VCD context the goals of compliance testing were often conflated with other goals such as the maintenance of central service components, which provided decision support on the basis of national and European legislation. Within and beyond the project, it has to be ensured that central components are operated, monitored and updated in a reliable manner and compliance testing can help to establish routines for system changes. Another interesting aspect that was well conducted with compliance testing outcomes was the definition of appropriate and suitable conditions for production pilots. As the VCD solutions only support a specific part of e-tendering, the solutions depend and rely upon other e-tendering processes. In order to establish and use VCD implementations in production, pilot guidelines and scenarios where necessary that clarify the dependencies and interrelations with other transactions, carried out with other, conventional means such as e-tendering platforms, out of the PEPPOL scope.

The paper references accessible artifacts that have been created in PEPPOL to clarify the application of the framework. The artifacts support developers and testers in the process to check and prove VCD implementations against the VCD specifications and underlying standards. In case of new releases, existing implementations can be

easily updated and adjusted using the guidance provided by these artifacts. In this respect the artifacts also support release management, maintenance and long-term sustainability. Furthermore adopters have a clear process to claim conformance to other network participants. These benefits show that a sophisticated framework for interoperability testing can strongly assist the process to develop and establish pan-European e-government services.

Future research is needed to elaborate and approve the aspects of interoperability testing presented in this paper with a particular focus on compliance testing. While conformance testing is a more mature technical method, which can be adopted easily by other projects, compliance testing is unclear in its appearance and definition. The division into legal, organizational and semantic compliance testing, pilots and end-to-end testing scenarios is a first step to frame the overall scope of compliance testing. As the results of this paper have been developed in purpose of the PEPPOL solutions, their universality is not fully given at the moment. Further evidence is needed regarding suitability in other contexts and projects.

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Representational Practices in Demands Driven Development of Public Sector

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Abstract. This paper concerns representational practices in demands driven development of public sector, and the problems they involve. The term demands driven development refers to a movement in public sector towards a closer cooperation with the citizens, primarily with regards to the development of public e-services. The objective with the paper is to explore representational practices through the analysis of practitioners' talk about demands driven development. There are several interrelated problems with representational practices, in this paper analysed through the discussions of practitioners who work with demands driven development of public sector. The conclusion is that these practitioners work with representational practices in a way which they at the same time seem to consider rather problematic.

Keywords: demands driven development, public sector, e-services, representationalism, feminist theory.

1 Introduction

This paper concerns representational practices in demands driven development of public sector, and the problems they involve. The term demands driven development refers to a movement in public sector towards a closer cooperation with the citizens, primarily with regards to the development of public e-services. This development currently takes place in Sweden as well as in other countries [15, 4]. The expected benefit of a closer cooperation with citizens is to make public sector more efficient and thus minimize public costs [4]. It is supposed that if the citizens are somehow involved in the development of these services, they will also be more inclined to use them [4]. Our objective is to explore representational practices through the analysis of practitioners' talk about demands driven development. There are several interrelated problems with representational practices; one is that they invoke questions of truthfulness, in terms for instance if a person really can represent a group of other persons [1, 2]. Second, categories open to representation are heterogeneous and multifaceted,

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 200–211, 2013.

thus making it problematic to talk about for instance 'women'. Third, categories are produced within existing dominant power relations [2]. Fourth, some are defined as inside the available categories whilst others fall outside, and some might not fit into any category and hence become invisible [3]. We will get back to these problems and discuss them more in depth in the following sections of the paper. Our main focus in the paper is to problematize representationalism in demands driven development, not to explore alternatives.

The question of who participates in participatory public projects such as demands driven development, and on what grounds, determines much of the legitimacy for these projects in the wider democratic system [12]. In the Swedish guidelines for demands driven development , it is stated that "A difficult question is how to find users who are representative for a target group and whose demands and wishes covers the demands of the whole target group. Additionally asking everybody is too costly. The point of departure should be that it is always better to have asked some than not to have asked at all. One does not get a comprehensive image of the demands, but at least some general demands can be found" [5:20]. Consequently the demands that are enunciated in demands driven development projects will depend very much on these users, whether they are representative of other users or not. The issue of representation is obviously central here, but in what sense is it possible for these participating citizens to be representative for someone else?

The paper is structured as follows: first the theoretical points of departure are presented, followed by a presentation of the research project. After that the research approach is described and after that the practitioners' talk about representation in demands driven development is analyzed. The paper is concluded with a discussion of the analysis.

2 Theoretical Points of Departure

The feminist science and technology studies (STS) scholar Karen Barad [1] argues that the idea of autonomous preexisting objects and subjects with inherent attributes lies behind the problems with representational practices, political as well as linguistic and epistemological. In her view representationalism is the idea that there exist two kinds of entities; first of all reality or real entities that can be represented, and second (mental or cognitive) representations of those entities. In a representationalist world view these are understood as separated and thus independent of each other. Sometimes a third party is included; someone who does the representing (an individual). Barad underscores that the problem is that entities – subjects, objects, various categories and so forth – are understood as autonomous from and unaffected by practices of representing. In such an individualist metaphysics gender, ethnicity, age, sexuality and class are understood as rather static properties located in individuals, which thus are possible to represent [1]. Judith Butler, another feminist science scholar [2], makes a similar analysis and argues that the (feminist) subject – 'women' – is not homogeneous, and furthermore does not simply exist as an independent being, waiting to be represented, but is rather produced by the discursive practices and structures

that are supposedly doing the representing. With such an analysis, an independent subject does not exist, but subjects are instead produced by the practices of which they are part, including the practices which purport to do the representing (more about this below). This argument is based on a constructivist point of departure in which practices such as representing not only describes an independently existing world, but also (re)produces the world. For instance in demands driven development projects in public sector groups of citizens are chosen as important. In this process several practices contribute to constructing these citizens as specific citizens, such as how these groups are defined and described – women, adolescents, immigrants, parents, elderly, students who are parents – how they are distinguished from other groups of citizens (for instance what defines an immigrant as opposed to a Swede?), on what grounds the demands of a specific group are important in a specific development project, and the conditions under which these citizens are allowed to formulate demands.

Representationalism causes several major and interrelated problems. The first of these is that since reality or the entities therein are not identical to the representations, the question of the truthfulness of these representations becomes central. Representations are supposed to work as a mediator between separately existing entities – that is, between entities in reality, and the person who does the representing. This generates questions of the correspondence between reality and the representations. For instance, can a person who participates in demands driven development accurately represent a whole group of individuals, for instance mothers [1]?

Second, categories of subjects and objects are not homogeneous, but categories such as women, men, Swedes, immigrants, adolescents and heterosexuals consist of a number of heterogeneous subjects. The problem is that when someone talks about women it is hard to know what this means, that is, what kind of woman this refers to, since women come in many forms – old, young, heterosexual, lesbian, middle class, working class, single, in relations, white, black and so forth. Talk about women furthermore indicates that women would be alike, when this is not the case [2].

Third, subjects and objects are produced by the practices, discourses and structures of which they are part [1, 2, 8]. Consequently there are no detached or independent entities which can be represented, and there are no independent entities which can do the representing, but instead these subjects and objects are produced by a variety of representational practices. Through these practices power is exercised, i.e. exclusionary practices of power are exercised in order to define what is being represented. For instance when a child is born in Sweden, and if the parents are heterosexual and married it is assumed that the man who is married to the child's mother also is the father, while if the man is not married to the mother but they 'only' live together, a fatherhood inquiry is conducted by the municipality in which the parents live. In other words legislative and administrative practices contribute to constructing fatherhood as self-evident only as long as the parents are married and heterosexual.

Fourth, this means that the categories that are available for representation are formed within dominant practices and power relations, through the performance of boundaries that include and exclude. This recognition places questions of who are included in the category of women, who fall outside, and who does not fit into any category at the center of attention [2, 3]. The above example about fatherhood also

exemplifies how legislative and administrative practices reproduce specific family norms, and thus contribute to marginalize other family configurations – such as same sex and single parent families.

2.1 Posthumanist Alternatives to Individualism

The alternative to representationalism is to focus not on preexisting subjects and objects, but on how these entities are produced in practices, something which many feminist scholars have focused on. Donna Haraway [10:328] writes: "Gender is a verb, not a noun. Gender is always about the production of subjects in relation to other subjects, and in relation to artifacts. Gender is about material-semiotic production of these assemblages, these human-artifact assemblages that are people. People are always already in assemblage with the world" Many of these researchers have extended the argument also to other identity formations such as sexuality [2, 3], class [19], ethnicity [7], religion [ibid.], and age [16]. This kind of research emphasizes how these practices are fundamentally entangled, and how they both enable and constrain specific subject formations. With such a point of departure gender – and other identity formations – should not be understood as individual traits which causes specific gendered doings, but instead gendered subject emerges or materializes as a result of specific performances and enactments. The construction of subjects is not done once and for all, but is rather an ongoing process of materialization which produce subjects, and of which subjects are parts. Butler [3] argues that the construction of sex as materiality is not done once and for all, but is in itself a process located in time, a kind of temporal unfolding or becoming, which works through the reiteration of norms. For the purposes of this paper we extend the argument to include not only the materialization of bodily formations, but also other identity formations, and understand subjects as a process of constant unfolding, that is, as something that is never set or fixed. With this view subjects are continuously evolving sociomaterial configurations of a variety of identity producing sociomaterial practices, which constantly vary and change. Identity producing sociomaterial practices are for instance linguistic and semiotic practices of talking, writing, and imaging, but also legislative practices of defining specific groups such as laws against discrimination.

This displacement from pre-given subjects and objects, to entities as the result and part of intra-acting sociomaterial practices has several implications related to the problems with representationalism mentioned above. Obviously the existence of subjects and objects cannot be taken for granted, but instead they are produced, reproduced and reconfigured in each new situation, as the sociomaterial practices of which they are part change. For representational practices this means that categories cannot be taken for granted, but must be construed anew, as locally situated, contingent and temporary categories, in each new situation.

2.2 Alternative Practices?

The previous discussion about how identity formations such as gender, age, ethnicity, and class should be understood as results and parts of ongoing productive material-discursive practices has several implications for demands driven development. First of

all, it becomes virtually impossible to represent anyone else, that is, a category of subjects such as women, on the basis that subjects are intersections (or configurations) of a variety of identity producing practices, which are constantly reconfigured. Second, in other words, it is practically impossible to configure stable and coherent categories, since subjects are fluid and volatile, and consequently categories based on some sort of subject formation(s) would be unstable and differentiated. If someone would consciously try to represent a category of subjects – such as colleagues on a department – the result would be a representation of what that subject believes about the category, and thus based on prejudices. The consequence is that a subject can only participate in demands driven development as her (temporary) self, who could be similar with others in a similar position, but this cannot be taken for granted. Furthermore, based on how categories are formed within dominant material-discursive practices, and how there always is a risk that some individuals fall outside of categories, actors working with demands driven development would have to be very careful with how categories are constructed. From the above follows that it becomes impossible to use preexisting and generic categories of subjects, such as the common demographic categories mentioned (gender, age, ethnicity, and class).

3 The Research Project

This paper is written within the frame of a now finished project about demands driven development of public sector, conducted in Sweden. The overall project objective was to deepen the understanding of demands driven development processes in public sector from the perspectives of organizational culture and design methods. The project lasted for a year, and was run by four researchers situated at three different and geographically dispersed universities in Sweden. Furthermore a group of about thirty practitioners working in Swedish government agencies were involved in the project as key actors. These practitioners were women and men with different job descriptions, experiences and educational backgrounds, but they all worked with and were responsible for the implementation of demands driven development of public sector in their respective organizations. This project can be understood as the continuation of an earlier project with a similar research focus [14]; two of the researchers and all of the practitioners took part in this earlier project. Within the project empirical material was gathered in several ways, such as through surveys, interviews and workshops with the practitioners, but policy documents were also used. Workshops with the practitioners constituted a central activity in the project; totally five workshops were arranged in Stockholm. These workshops had different themes, all based on the suggestions of the practitioners: representativity, accessibility, crowd sourcing, scenario based decision making, and critical design. Most parts of the workshops were filmed by a media specialist who also took part in the project. The workshops had the following structure; they took place between 9.30 and 15.00, and included a lecture of one or more invited speaker(s) (a researcher and/or a practitioner) who talked about the current topic. Furthermore the topic was treated through assignments in smaller groups, and discussions in the whole group.

4 Methodological Approach

The project was developed in rather close relation to the practitioners, who had chosen topics for four of the five workshop themes, and the objective was to develop new knowledge in close cooperation between researchers and practitioners. The first workshop considered representativity in demands driven design. Seven practitioners from various government agencies participated in the workshop. During the workshop an invited researcher in political science was giving a lecture about representational issues and recruitment strategies. This topic was discussed in the whole group, and the participants were also divided into two focus groups that were asked to discuss representation in relation to the recruitment strategies used in their own organizations. The participants in these focus groups were asked to do a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of the recruitment strategies they practiced. This means that even though the topic of representation was initiated by the practitioners, the researchers developed and expanded this topic in a specific way. Consequently, the talk that is analyzed below is far from spontaneous talk, but instead it can be understood as – at least in part – the result of the survey and the lecture about representational issues.

The empirical material that is the basis for this paper consists of notes and recorded and transcribed group discussions from the workshop, while results from the survey are used only briefly. The practitioners and the government agencies in which they work are anonymized in the paper. This material was analyzed with the help of the theoretical framework described above, in which the problems with representationalism is said to consist of four different but interrelated parts; first of all representational practices raise questions of truthfulness, in terms for instance if a person really can represent a group of other persons. Second, categories are heterogeneous rather than homogeneous. Third, categories are produced within existing dominant power relations, including representational practices. Fourth, since categories are the result of boundary making, some are defined as inside existing categories whilst others fall outside, and some might not fit into any category and are hence become invisible. If these are translated into the context of demands driven development the issue of truthfulness concerns whether a specific person or group do or can represent someone else, like a (larger) group. The issue of heterogeneous categories concerns how groups of individuals are heterogeneous rather than homogeneous. The issue of how categories are produced within existing power relation, concerns how categories of persons are made, and by whom. Finally the issue of whether some falls outside of existing categories concerns whether some individuals are forgotten or not included.

These four issues of representation are used as an analytical framework, in order to explore how the practitioners talked about these issues during the workshop, something which indicates how they are understood and handled. However, that they talk about representation in a specific way does not necessarily mean that this is also how they do in their daily work practices. In other words we searched for how instances of these four representational issues turned up in the notes and the transcriptions of the discussions. Furthermore we searched the survey results for indications of how representational problems were understood and handled.

5 Representational Practices in Demands Driven Development

The survey result indicates that the practices for working with demands driven development, that is, for involving citizens in the development of various e-services, are very different. Some work with personas[1], some work with so called behavioral groups, some have established networks of clients which they cooperate with, some work with focus groups, and some are happy just to find any participants for their development projects. Based on these different practices, representationalist problematic becomes very different. Below a number of citations from the transcribed group discussions, and from notes taken during the workshop about representations are presented. These citations are selected because they in some sense touched upon the topics described in the analytical framework; the issue of truthfulness of representations, the issue of heterogeneous groups, the issue of how categories available for representations are produced within various power relations, and the issue of how some are excluded from available categories, and thus become invisible.

5.1 The Issue of Truthfulness

A. … that's how we use to do when we have specific services that are aimed at [a specific group of users] … then we chose among those who are professional users of a service, then we chose those who are large, who have very many cases … those who are in between and those who do not use it at all in order to get the whole perspective … (*from transcriptions*)

In this first example one of the practitioners discussed how they in her organization use to choose participants when they work with the development of a specific service. Their clients are businesses of different sizes, and so the users are working in and with those businesses. Thus they use to select among these the businesses that are large and use the service very much, the businesses who use the service sometimes, and those who do not use the service at all. This indicates that they try to select users for their development projects in order to reach a specific representativeness – or in other words in accordance with the use patterns of the whole group. The strategy for achieving accordance with this heterogeneous group is to try to find users who represent the extremes and the medium of businesses; those who are frequent users, those who are medium frequent users, and those who are non-users of the service.

B. … if I would say like this: "Now I turn to you because you are a larger representative who work with agency 2, now I want you to put on a general representation hat". Then they would not be interested … then you chose a few [representatives] and you get a more nuanced picture … but not that … one would try to say that you are here as a representative and not from your own parts [e.g. department or organization], not that you should try to put on the whole guild's… (*from transcriptions*)

[1] Personas are hypothetical users [18].

Our interpretation is that the practitioner here discussed how some of the potential participants in the development projects run by her organization would not be interested if she would ask them to participate as representatives of their professional society (or guild). The practitioner believed they would only want to participate if they could represent themselves, and pursue the questions that are interesting for them, but not if they would have to work for their professional colleagues in other organizations. This is an aspect of representation that is related to whether participants *want to* participate in their own interests or in the whole group's – but the assumption is still that someone *can* represent a whole group. Nevertheless, with this statement ("now I want you to put on a general representation hat") the practitioner pointed to an indistinctness in representational practices; how is one to know whether someone represents him/herself, and not someone else, like a professional society? Can someone represent both at once? Do they?

The rather frequent occurrence of these and similar enunciations indicates that the practitioners are well aware of the problematic of letting someone speak for or represent an entire group. On the other hand, both group discussions and the result from the survey indicates that several of the practitioners are rather happy to have *any* participants in their supposedly demands driven development processes ("We are happy to have any [participants]" (from survey)), and in those cases, issues of whether these are representative for an entire group seemed to become subordinate.

5.2 The Issue of Heterogeneous Categories

C. Anne: … well, immigrant women then we might have that group … perhaps you don't think twice … kind of like we do now, we talk a little about … we look at an assignment which concerns people who want to come here and … from a third country .. it's like a lump, it's like four billion people that can be very heterogeneous … but we kind of lump them together in that way, I do not know whether it is the right way to lump them… (*from transcriptions*)

In this quotation one of the practitioners was talking about the problematic practice of lumping large numbers of heterogeneous individuals into one group. The practitioner mentioned immigrant women, and then went on to talking about four billion people from a third country[2]. The practitioner also seemed hesitant to whether this was right, or a good way of lumping these people together ("I do not know whether it is the right way to lump them…"). With this statement this practitioner raised the issue of how groups are heterogeneous, but also how they are produced in practices, and she questioned whether these practices are right. Indirectly the statement thus concerns the power of practices to produce groups, and how this power is used.

[2] The term 'third country' refers to countries outside of the European Union (EU), the European Free Trade Association (EFTA), the European Economic Area, and the candidates to the EU (Universitets- och högskolerådet) [20].

5.3 The Issue of How Power Relations Produce Categories

D. Anne: And the two threats we were talking about was that the one who represent might not understand that s/he represents and the other that we might not have been enough clear with that … have we thought right about this strategic group, or have we chosen someone because "Oh, now we got a woman too, and a man…"

Karin: But wasn't it too that … I was thinking also that these … what was it you said here, that you don't understand that you represent something larger, but it might be two different things…

Eva: Yes but sometimes you don't. Then you anyway represent yourself, but I include you, your perspective because you are an immigrant woman, then I include your perspective but you are not expected to talk for everyone… (*from transcriptions*)

This discussion among the practitioners touched upon several issues relating to how power relations are involved when groups are constructed. Anne talked about how someone might not understand that s/he is representing a group, and that this might have to do with that 'we' have not been enough clear with that. 'We' in this case refers to Anne and her colleagues at the agency in which she works, or more generally practitioners working with demands driven development of public sector. Anne also talked about the risk that 'we' have not thought right about a particular group. Our interpretation is that to 'think right' about a group means to construct the group in a way that makes it representative for a larger group. To be able to think right or wrong when constructing groups clearly concerns the power to construct groups, whether the result is considered right or not. Karin responded by talking about the risk that participants do not understand that they represent someone else, like a larger group, while Eva talked about how participants are sometimes included because they belong to a specific group, like immigrant women, even though they are expected to talk only for themselves. Our interpretation is that Eva with this statement raises the issue of how someone is chosen because s/he belongs to a marginalized group – in this case immigrant women – but she nevertheless does not want this immigrant woman to represent anyone else, but only to represent herself. As in previous quotations this refers to the ambiguity for a participant to know whether s/he is supposed to talk for her/himself, or for a larger group. This recurring issue concerns the importance to inform the participants of the expectations of their participation, something which is central to the practitioners because this is part of their responsibilities. This statement also concerns power in terms of how someone is chosen to be included because they supposedly belong to a specific – marginalized – group.

E. Eva: But I think also that perhaps one does not want to … that one should believe that one represents, that I have chosen you because you represent a Chinese person, but I don't want you to believe that you … I want you to speak for yourself, I want you to tell your story … I don't even want you to try to speak for all Chinese …

> Karin: Because if you do you have yet another source of error when you come to the analysis phase cause then it's not only this person's opinions in the first hand but it's others or his whole imaginary image with prejudice filters and knowledge filters and that you have absolutely no control of … (*from transcriptions*)

This short transcription concerns the power to construct categories ("I have chosen you because …."), but also how this is a contingent power. Eva said that she had chosen a Chinese person, but she did not want that Chinese person to represent anyone else than her-/himself. This statement indicates that she can never be sure of whether the Chinese person understands her-/himself as representing anyone else, or if s/he acts as a representative for anyone else. This can be understood as a way for participants who are categorized to resist and transgress the categories imposed on them. Karin responded by talking about how persons presumably representing others can only speak for others based on what they believe about others, that is, based on prejudices and limited knowledge. This is yet another aspect of the (im)possibilities to correctly represent others, that these practitioners have to deal with. Consequently, the practitioners cannot know whether the participants in their development projects in their own views represent themselves or others, and if participants in their own views represent others, they do so based on prejudices and limited knowledge.

The issue of production of categories was mentioned at several occasions, indicating an awareness of the problematic. No one specifically mentioned the word power, but since practices for selecting participants was discussed, and the consequences of these practices for representational problems, power was still an issue.

5.4 The Issue of Invisible or Excluded Subjects

The issue of whether someone is left out or forgotten – that is, those that are excluded by the existing categories – is rather invisible in the material; we could only find one instance of this. This example comes from common discussions (based on the notes), in which one of the groups brought up focus groups as a possibility to find and include minorities. It was not specified whom the term minorities might refer to, and this indicates that they were aware of the existence of minorities that might not be included. The example is not entirely self-evident, but it is what comes closest to the existence of individuals who live outside of existing categories.

6 Discussion

The objective with this paper was to explore representation through the analysis of practitioners' talk about demands driven development. The practitioners were discussing how they work with representation in their development projects, and how they sometimes only had very few participants – as few as one – and were happy about this. Despite this they also discussed in a rather sophisticated way the problems with representational practices. In other words the practitioners seemed to agree with Butler [2] and Barad [1] about the problematic with representational practices; but

nevertheless they seemed to keep on working with representational practices in their development projects. Our empirical material gives no indications as to the reasons for this, but clues to the reasons for this situation may be found elsewhere. One reason is probably the dominant position of representationalism in our society [1]. Representationalist practices are everywhere; in everyday linguistic practices words are taken to correspond to objects, subjects or some aspect of reality. In research and knowledge making individuals are regularly classified into women and men, upper, middle and working class, Swedes and immigrants, living in rural or urban areas, various groups based on age, or employed and unemployed, and studied and described based on these classifications. And in representational politics politicians are expected to speak for (or represent) various interests or perspectives. These representational practices are an important, routinized and taken for granted part of our everyday lives. Representationalism and its individualist foundation is not only an understanding of the relation between reality, knowledge and humans, but it is regularly produced and reproduced in these and other practices, of which the practitioners' work with demands driven development are part.

There also seems to be a lack of alternatives to representational practices – or are there alternatives? Barad [1] discuss how representationalism did not always hold this dominant position, and how there are alternatives. It might be that the alternatives are made invisible, because current state of affairs serves central interests, and because influential actors gain some sort of advantage. Representational practices is common in political systems such as representational democracies, but also in numerous statistical practices [13, 6] – in research, marketing, surveys, and the production of government statistics – which categorize individuals and then describe them based on these categorizations. Additionally representationalism is an integral part of positivist research practices in which subjects and objects of study are presumed to exist as stable and autonomous phenomena, independent of researchers and research practices [17, 11, 1]. Positivist research practices are closely linked to natural and technological sciences such as mathematics, physics, chemistry, biology, engineering science and medical science; sciences which are and have been important for creating the wealth and socioeconomic welfare of current industrialized countries [11]. Taken together, these are deeply institutionalized sociomaterial practices which take place in several different areas of society, and which are not that easy to change, because they are an integral part of how our society works, and quite a lot of individuals make their livelihood from the organizations, companies and institutions that are involved in these practices.

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Process Management Challenges in Swedish Public Sector: A Bottom Up Initiative

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Abstract. Public administration is under pressure to work more effectively and increase effectiveness with regards to internal administrative processes as well as level of service towards citizens. This paper identifies process management challenges encountered in Swedish municipalities and provides concrete examples of consequences of these challenges by using a bottom up approach. It is done by using a common public service process and a mobile solution as platform for discussions with municipal officials working with the process. To categorise the challenges they are grouped into six core categories of business process management, which provide a picture of challenges that municipalities face today. Results show that Swedish municipalities face challenges in all categories and that it was not possible to design a generic process for the analysed service. To initiate work with improving process maturity in local governments the bottom up approach used was found successful.

Keywords: Process management, public administration processes, e-government.

1 Introduction

The public sector is struggling to become more effective. A driving vision to accomplish this goal is articulated as e-government and refers to improving public sector by rationalizing administration and improving the information and quality of services to citizens [1]. E-government utilizes information and communication technology to transform public administrations structures and processes [2] to increase efficiency and effectiveness. Sweden is considered as being in the forefront of e-government and is one of the highest ranked countries in [3] e-government development index. There are many policies and guidelines communicated from higher-level authorities that underline the importance of improved process management and increased collaboration in public sector [4-8].

With a total of 290 municipalities in Sweden the municipal government stands for 70 % of the total public administration and is thereby considered a very important part in the realization of the e-government vision [5]. Swedish municipalities are autonomous and therefore choose to govern their own e-government initiatives; however they still have to comply with the same laws, policies and guidelines.

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 212–223, 2013.

This paper builds from experiences from a research project aiming to develop a fully integrated mobile complaint and problem reporting system (CPR system) [9]. In the project, processes for management of complaint and problems in Swedish municipalities were analysed with the aim to design a generic process model to be used in the new CPR system.

The objective of this paper is to highlight the process management related challenges encountered in the work with the municipalities. This objective is guided by the following research question: *Which challenges do municipalities face in their process management?* A bottom up approach is used were the complaint and problem management process and the CPR system is used as a platform for discussion and to identify process management related challenges.

There are many well-known and investigated benefits from working according to process-logic [10-11]. Research focusing on process challenges for the Swedish public sector has limited empirical foundation. This paper presents process challenges in the Swedish public sector from the view of the people working with the processes and by the researchers' analysis of the processes. It unpacks the challenges by giving concrete examples of how these challenges leads to inefficiencies in the daily work of municipal workers.

The challenges are analysed from a business process management (BPM) perspective by categorisation of the challenges according to [12] "six core elements of BPM". The paper contributes with a clear view of current challenges encountered within municipalities and what needs to be addressed in their process management work.

The paper is organized as follows: The next section gives a description of related research. Section 3 describes the research method and data collection techniques used. Section 4 presents the results and section 5 concludes the paper and directions for future work are presented.

2 Previous Research

2.1 Process Management

Business processes describes how business functions and they are central in Business Process Management [13]. Business process management (BPM) encompasses knowledge and practices from several areas [12] thereby creating a holistic management approach to business processes. [14, p. 4] defines Business process management as "supporting business processes using methods, techniques, and software to design, enact, control, and analyse operational processes involving humans, organizations, applications, documents and other sources of information". The objective with business process management is to improve the performance of organizations by making them more effective and reduce costs. This is enabled by constantly analysing and improving business processes. Improving the quality of public sector business processes can for example be done with the help of verifications tools [15-16]. BPM promotes agility and flexibility in which organizations can quicker adapt to changing market conditions [17]. Since BPM is a holistic management approach it includes all

phases in a business process lifecycle. The BPM lifecycle proposed by [14] contains the phases design, configuration, enactment and diagnosis.

[12] Identifies "six core elements of BPM" that organizations need to regard in order to succeed with BPM: strategic alignment, governance, methods, information technology, people and culture. The goal with strategic alignment is to promote business performance by harmonizing organisational priorities and business processes. BPM governance handles roles and responsibilities at different levels of BPM. Also important in BPM governance is the decision making and reward processes that have impact on process associated actions. Methods related to BPM are tools and techniques that facilitate actions throughout all different stages of a process lifecycle, process projects and programs within an organization. Information technology relate to hardware, software and information systems that are aimed at supporting BPM. An example is process aware systems. People are the BPM knowledge within the human capital of an organization that constantly improves and applies their process abilities and knowledge to improve business performances. Culture has a strong influence on BPM achievements and it concerns attitudes and behaviors formed by mutual values and beliefs regarding process orientations. [12]

2.2 Business Process Management Challenges

To the researchers knowledge there is limited empirical research that highlights process management challenges that Swedish municipalities face. Research on process management challenges has been made in other countries and for other domains. [18] Reports on BPM issues from industry identified by conducting a focus group study with participants from several different Australian organisations. BPM issues and challenges that organizations in Australia face are presented and grouped in three high level categories: Strategic, Tactical and Operational. Examples of identified strategic challenges are shortage of governance and management support. At the tactical level examples of challenges are shortages of expertise, coordination, BPM understanding, visibility and standardization. Operational challenges examples are shortages of technology capability, integration and tools for holistic BPM. [19] and [20] are two related studies to the [18] study that report upon BPM challenges and group them after Strategic, Tactical and Operational challenges. [19] Reports BPM challenges identified through interviews with domain expert from the industry and [20] reports BPM challenges identified through interviews with BPM vendors. [21] Reports on experience from implementing process management in three private organisations in Sweden and calls for further research in this area.

There are studies focusing on process management related challenges in the public sector. [22] Explore process management and integration issues in a local council in the United Kingdom. Through a case study approach they study a public service process (the student loan application process) by conducting semi-structured interviews with four local authority staff, one representative from a partner organization and one citizen. In their research they identify technical and organizational challenges and the most important challenge for the local council was shortage of coordination and integration between the different stakeholders. There are also studies that

investigate challenges in limited parts of BPM, for example business process modelling challenges and issues studied by [23] and challenges related to BPM methods studied by [24].

More recent studies investigate limited parts of BPM in different countries. [25] Investigates success factors and obstacles affecting BPM governance in local governments in Brazil. Main obstacles identified are lack of competence, BPM awareness and a non-process oriented culture. [26] States that local government in Germany lack BPM capabilities and therefore have problems with adjusting to a constantly changing environment and that they are under a financial pressure. [27] Presents an initiative on configurable process models and reports on difficulties for a municipality in Sweden to fully utilize the configurable approach due to a number of reasons connected to low process maturity.

3 Research Method

To answer the research question a case study research has been conducted. Case study research is a studying "a contemporary phenomenon within a real life context when the boundary between the phenomenon and its context is not clearly evident" [29, p. 13]. Case studies can be used in descriptive and exploratory research [28].

In this study the contemporary phenomenon is process management and the context is complaints and problem management within Swedish municipalities. The researchers have studied the phenomenon through the context of complaint and management handling at five different municipalities, thus following the case study methodology of viewing a phenomenon as tightly bound with the context were it is studied. Challenges related to process management are captured through the participants' descriptions of their view of the complaints and problem management process and the researcher's findings from being active participants in the analysis of the processes and when designing a generic process model.

The complaint and problem management process is a suitable process to study since almost all municipalities in Sweden offer the service; it is also one of the most common e-service provided by Swedish municipalities [30]. Different units within a municipality handle complaints and problems reported by citizens and the handling of complaints and problems often spans over several administrative units.

3.1 Data Collection and Analysis

To collect data ten workshops with municipalities were performed, all municipalities volunteered to participate. All of the workshops were performed at municipality facilities with municipal officials participating. The number of municipal officials that participated during the workshops varied between 2 and 10 persons and the number of researchers participating varied between two and three. The municipal officials that participated hade different roles relevant for the process that were analysed e.g. IT managers, assistants, administrators, register clerks. A high level official made the selection of participants from the municipalities at each municipality. Prior to the

workshop the researchers had communicated the scope and aim for the workshops and asked the responsible high level official to include suitable persons. The agenda for each municipality were structured in the same way. First all participants presented themselves. The researchers presented their research area and their intentions with the meeting. Secondly the research project was presented and the advantages and disadvantages with the solution were discussed. Then the current municipal process for complaint and problem management were analysed by letting the officials describe their work tasks and in what order from receiving a complaint or problem to the case is finished. The identified tasks were written on post-its or on a white board, and notes were taken by the researchers. Thereafter the agenda ended with analysing the to-be process for complaints and problems with the app included as a new input channel. More workshops were conducted in some of the municipalities because it was more time consuming to go through the agenda in these municipalities. Table 1 shows a compilation of the involved municipalities and the number of workshops carried out at each municipality.

Table 1. Participating municipalities

Municipality	Abbreviation	Number of workshops
Municipality 1	M1	3
Municipality 2	M2	3
Municipality 3	M3	1
Municipality 4	M4	1
Municipality 5	M5	2

During the workshops discussions regarding issues related to business processes were brought to life. The participants made statements about perceived challenges related to business process management. Often the statements fuelled a discussion witch led to new statements. The researchers were passive during these discussions to minimize the risk of being leading. Also the challenges that the researchers encountered when analysing and modelling the processes were noted.

Apart from the workshops also documents (requirement specification for the CPR system, municipal routine description) and artifacts (case management systems and front end app) have been used as data.

In order to analyse the collected data all notes from each workshop were first discussed and compared by the researchers. The researchers then tried to model the processes in Visio following the notation of YAWL [13]. All data material related to process management challenges were then compiled and analysed, and challenges were derived by the researchers' interpretations. To create a better understanding and overall view the challenges were then categorized by using the labels of [12] six core elements of business process management. The reason for using this categorisation is that it encompasses all elements needed to provide a holistic understanding of BPM [12].

4 Results

In this section the results from the empirical study are presented. All challenges found and to which BPM core element the challenges relate to are compiled in table 2. Then, each challenge is described and examples of how these challenges leads to inefficiencies in the daily work of municipal workers are given. If nothing else is explicitly written, a challenge is described if it was encountered in three or more municipalities.

Table 2. Process Management Challenges

BPM Core Element	Challenge
Strategic Alignment	Organisational structure, initiatives, legal aspects, politicians and management agendas
Governance	Responsibilities, process owners, information management
Methods	No methods
Information Technology	Multiple IT systems, IT system integration, legacy systems, Proprietary systems
People	Routines, education
Culture	Responsiveness to change, resistance to change

4.1 Strategic Alignment

The organizational structure of the municipalities in isolated silos is not aligned with a process oriented approach. M4 explained that the social service unit functions as a world of its own. This causes insufficient insight and lack of relevant knowledge of other units regarding responsibilities and how they work. “No one sees the entirety, everyone only see their part” (M4). For example in M1 it happens that a submitted complaint is received by a unit not responsible for solving a complaint of that nature and the receiver doesn’t know to what unit it should be forwarded. This has a negative impact on the effectiveness of handling the issue.

Functional silos also resulted in difficulties to perform process design. In four out of the five different municipalities involved in this research it was not possible to design a single complaint and problem management process. That was due to considerable differences in the work routines between the different administrative units.

Initiatives taken are not aligned with process management. E-service for complaints and problem reporting is designed in a way that could easily lead to misinterpretations by citizens. For example in M1 e-service for submitting complaints and problems the citizen needs to state the administrative unit that the issue will be sent to. The purpose is to simplify the administration of cases within the municipality. If the citizen chooses the wrong administrative unit when reporting, a case can “theoretically spin around a lot in the system between different administrative units” (M1).

In M5, they have implemented a customer service that is intended to work as a single point of contact where citizens can submit all types of cases. The customer service is not integrated with the municipality’s complaint and problem management process, “it is a completely separate process” (M5).

Management and politicians agendas are not always compatible and in Sweden elections are held every fourth year; theoretically a new political agenda might be the result of each local government election. Change of political agenda is something that can affect all municipalities in Sweden since the same political system applies. To what extent it poses a challenge is due to the differences in agendas and municipalities' ability to change. Only M3 and M5 explicitly mention this challenge by stating that management and political agendas don't always match.

Legal aspects and legislation changes complicate the routines at the municipalities. For example in M1, if a complaint about a mistreatment is submitted through their e-service the complaint is registered automatically in the system integrated with the e-service. This particular system doesn't meet the legal requirements of archiving cases that belong to the social welfare office. Therefore a mistreatment complaint needs to be manually registered in another cases management system that meets the legal requirements. Clearer laws regarding the municipalities' responsibilities to handle for example pupils being bullied at school such issues has to be archived correctly and therefore entered into a specific system. In M4 a new law that relate to care result in that the municipality need new fields in their case management system.

4.2 Governance

No clearly defined and communicated responsibilities are a challenge that cause inefficiencies in municipalities process management. M1 exemplifies that a register clerk forwards a submitted complaint or problem to the administrator that shall send a reply to the citizen. When the register clerk forwards the complaint or problem a confirmation that the message has been received with the administrators contact information is sent to the citizen. If it is unclear which administrator should answer the citizen and the issue is forwarded to the wrong administrator then the citizen may contact the wrong administrator. An issue might even be closed but continue to move around in the organization or an issue might be overlooked because of unclear responsibilities. 28.1 % of the issues in M2 are initially sent to the wrong administrator.

No process owners have been present in any of the workshops with the municipalities nor have any of the municipal workers mentioned that a specific person is responsible for the complaint and problem management process. However, the researchers have noticed that some people take a lot of responsibility for the process, unofficial process ambassadors exist.

How information is managed is a challenge that causes uncertainties. M5 is experiencing uncertainties in what needs to be documented and it is perceived hard to get an overview when people store documents in their desk or in a file folder. M4 experiences that information is not spread throughout the entire municipality.

4.3 Method

During the workshops the researcher did not encounter any challenges related to methods nor did any of the municipalities mention anything about methods related to BPM. This could in itself be seen as a challenge, i.e. lack of methods for BPM.

During the discussions about the complaint and problem management process none of the municipalities provided any reference process models.

4.4 Information Technology

All of the municipalities use multiple IT systems that are most often not integrated which cause manual tasks and overhead work. In M1 some cases has to be finished in one system and then registered manually in another system and sometimes cases are double registered. M1 exemplifies by describing when a registration of an illegal building are sent in by a user and registered automatically in the wrong system. The case is then finished in that system and instead the case needs to be manually initiated in the correct system. Another example from M1 is when a submitted case concerns a problem that needs to be fixed by an external provider an order cannot be created directly in the system, but needs to be created in a separate system. M1 describes their system for complaints and problems as an intermediate system and wishes for integration with other backend systems. In order to extract statistics on issue handling within M2, problems need to be registered in two different systems. M3 doesn't use the full potential in their systems; instead they buy new systems when functionality is needed. M3 states that "it is completely preposterous to buy new systems instead of developing what you already have". In M5 says that "we don't utilize our system to the fullest", instead we "buy different systems for different purposes and they have never been integrated".

Due to legacy systems and proprietary systems municipalities have trouble integrating systems. M1 and M2 describes that many municipalities have a closed environment; it makes it harder to integrate the system. M3 describes that they have old systems and that the providers doesn't provides specifications such as XML schemas. Legacy systems still running within municipalities doesn't have functional support for automation of tasks and the interfaces are difficult to use for infrequent users thus creating problem for administrative workers that do not receive issues frequently. "Our system is difficult to use and therefore the usage is not spread throughout the organization, only very few people use it" (M2). In M3, one of their IT systems is not compatible with windows 7 so they have to log on to a remote desktop, which creates "another window among many windows". Also, what the researchers realized when they got access to the different municipality IT systems is that many of the systems are not process oriented and does not support the work routines associated with the complaint and problem management handling.

4.5 People

Ad hoc routines and uncertainties in work routines are two people related challenges. Many administrative workers prefer to give answers directly to citizens contacting them and skip the registration of the issue in the case management system. It is not communicated through any system what issues are solved, instead messages about solved issues are e-mailed to one person in the organization, no one else knows about the status of issues (M2). In M3 not all administrators are using the case management

system and if they answer something directly to a person they do not register it in the system. M5 stated that the have shortcomings in their administrative routines, they perceive uncertainties in how things should be handled. Deficiencies in routines are also emphasized through the following quotes: "I am guessing that we have a number of complaints, but they are probably stuck somewhere" (M5).

Citizens use communication channels that are not intended for submitting complaints and problems, e.g. in M1 citizens sends e-mails directly to the municipality workers e-mail instead of using channels that are connected to the case management system. Some citizens that frequently submit issues learn the administrators e-mail addresses and sends e-mails directly to them. "Some cases fall outside the system and it creates manual work" (M1).

Municipalities don't put effort into educating and gain approval by the ones affected when buying new IT systems. In M4 it is not communicated how new technology is supposed to be used. "People feel burned" (M4). M3, "the management commitment, the people and education are what are required for an IT system not to be a system on the shelf." In M2 only a few persons work with their case management systems because the usage is not spread throughout the organization.

4.6 Culture

Responsiveness and resistance to changes are challenges in municipalities. M4 worries that they might not be able to handle the change the CPR system will bring, since they perceive that there are constant changes and they cannot handle changes all the time. There are evidences of people in the municipalities seeing process management as something with potential: "That everything is connected is important, that you see the complete picture and not only the work that you do" (M2). They see the need but have difficulties responding to it. "The negative thing about this integrated application is that we have to get resources to handle issues from this new channel. We cannot create an information flow that we are not prepared to handle and we should not implement the channel before we are ready. We are not there yet, we are not ready." (M2).

5 Conclusion

This paper has identified challenges within all of the six core elements of BPM *strategic alignment, governance, methods, information technology, people and culture* [12]. The results show that municipalities are still being organized by functions and therefore the organizational structures of municipalities are not aligned with a process oriented approach. Poorly defined and communicated responsibilities are another governance challenge that causes inefficiencies in municipalities' process management. No methods supporting process management exist. Municipalities are also facing challenges related to information technology such as usage of multiple IT systems, IT system integration, legacy and proprietary IT systems. Challenges related to the people working with the process using various ad hoc routines and not being

sufficiently educated were also found. Notable challenges found related to culture are responsiveness to change and resistance to change. For the researchers many of these challenges contributed to the difficulty of creating a uniform view of the process and to determine a best practice process for complaints and problems management. IT (a process and an artifact) was used as an enabler (door opener) to stimulate and fuel the exposure of the challenges. It was a successful approach for starting a change dialogue because the municipal workers had a willingness to collaborate and change, and also showed openness to adopt the new IT artifact.

The results imply that process management maturity in Swedish municipalities is low. Municipalities are struggling with taking the first small steps in re-organizing according to process-logic, despite visions from politicians and despite Sweden being ranked high in e-government development. Similar empirical evidence has been identified in previous research [18-20, 22-26].

For academia this paper informs about the low maturity within Swedish municipalities in regards to process management. It complements existing studies and provides a contemporary view of process management challenges. The paper also provides valuable insights of challenges that need to be address and can be used to position future research. This paper strengthen findings regarding low BPM maturity in local government found in other countries examples are [26] in Germany and [25] in Brazil.

For practice this paper contributes in providing an understanding of identified challenges giving examples of how business process challenges leads to inefficiencies in the daily work of municipal workers. The approach to use an IT artefact to fuel discussion and implement change was deemed usable when rationalising processes and improving process maturity within the public sector. This approach should therefore be taken into consideration by public management when initiating change within municipalities. Business process initiatives within municipalities should take a holistic perspective of process management since challenges were found in all core elements of BPM. The researchers also see the need for municipalities to get a bottom up support by complementing e-government policies and guidelines with instructions on how they can be implemented at a local level e.g. instructions of how single public processes can be transformed to promote e-government. Today e-government is promoted by a top-down approach were abstract policies and guidelines are communicated towards municipalities' and they have to implement them on their own.

Limitations of this study that affects the transferability of the findings are that the municipalities' were not randomly selected and that only Swedish municipalities were studied. However the author argues that it is reasonable that the results are transferable to other local governments in other countries due to similarities in the result of earlier related studies (see above). Also, this paper does not consider cross sectional variance; that is how the challenges are influenced by differences between the municipalities and the study is limited to the investigation of BPM related challenges.

We propose future research to focus on strategies for how to overcome identified challenges and present a structured framework with challenges and success factors. Also building collaborative solutions together with private partners should be investigated.

Acknowledgements. The author would like to thank the Swedish Governmental Agency for Innovation Systems and NordForsk for founding the research project.

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Business Processes and Standard Operating Procedures: Two Coins with Similar Sides

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Abstract. Concepts and tools for process management have often been transferred to emergency management projects. The driving objective has been to bring assistance to planning procedures and quality assurance. This seems rather natural, since idea and concept of business processes and standard operating procedures appear like siblings. In this paper we discuss whether the concepts of process modelling are adequate for managing standard operating procedures and whether emergency management organisations can capitalize on off-the-shelf business process modelling tools to prepare for disasters more effectively. This paper presents ample evidence that prevailing business process means are inappropriate for emergency management in light of organisational as well as technology issues. In a nutshell, business process concepts are utilized as a "golden hammer" in many emergency management projects, a suitable tool for all purposes. Yet, the question rises whether emergency management issues are always fitting nails.

Keywords: Process Management, Business Processes, Standard Operating Procedures, Emergency Management.

1 Introduction

We conducted several research projects in cooperation with emergency and relief organisations. Their pivotal objective has been the improvement of planning processes in terms of quality and time. Results of planning processes typically become manifest in Standard Operating Procedures (SOP), be it in medical or emergency management domains. Since SOPs appear rather close to business processes, the suitability of business process management (BPM) tools was obvious. Hence, the question arose on how to utilize BPM methods and tools for designing SOPs.

Once embarking on this endeavour, one typically faces subsequent core challenges:

- Does planning of emergency and relief services differ from planning processes in business environments in terms of objectives, methodology or interests?
- Do formal process models offer benefits to the conceptual design of standard operating procedures of emergency services?
- What changes to business process management means are instrumental for planning emergency services or can prevailing tools directly been used?

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 224–236, 2013.

- What is the added value of business process analytics once being used for assessing the quality and effectiveness of planned procedures?

This paper structures our findings along several dimensions in order to expose similarities and differences of both worlds, e.g., standards for business process management versus the prevalent folklore of emergency organisations. To make a long story short: we argue that standard business process means are currently not suitable for emergency management planning.

This paper is organized as follows. After an introduction about business process management, we introduce some pivotal characteristics of the emergency domain and give an overview about our projects in this domain. We present in the fourth section our experiences about the relationship between BP management and emergency management. Following an overview table with driving issues we elaborate our findings in detail. Finally, we draw our conclusion for the sake of planning counter measures.

2 SOPs and Business Process Management

A Standard Operating Procedure describes 'a set of written instructions that document a routine or repetitive activity followed by an organization' [1] and is a 'written, numbered organizational directive that establishes a standard course of action' [2]. The concept of SOPs is mainly used in emergency management, military, and medical context.

Similarities between these SOPs and the definition of business processes are obvious taking into account that a process is defined as a 'set of partially ordered activities intended to reach a goal' [3] or that 'a process is thus a specific ordering of work activities across time and place with a beginning, an end and clearly identified inputs and outputs: a structure for action' [4].

Consequently, several security related projects have directly applied process management means to standard operating procedures for emergency management. Many of these projects sought a partial automation of control flows for the execution of standard operating procedures [5-8]. That is, standard operating procedures served as blueprints for workflows, which can be directly translated into executable activities and by the same time impose control structures. Following this line of approaches automation and assisted procedures became the focus of direction. Other approaches strived for seamless information flows by integrating information management and data streams inside as well as between command centres [9-11] or between command centres and rescue units during a crisis [12-14].

In the course of their projects all of them realized that the identification of procedures of rescue organisations is essential for any research contribution that aims to improve the support of rescue workers and their organisations [15]. But unfortunately, they found no adequate means for domain experts to grasp, to describe, or to formally model their courses of action themselves for daily routines or even large-scale crisis. Once, third-party experts with a modelling background are involved in the formalisation of standard operating procedures, commercial process management environments become instrumental. Yet, the question of adequacy of the process model comes as a

concern, i.e. how close is the model with its abstractions taking into account the domain's inherent complexity and variety.

Our research intention has been to support emergency experts in their modelling endeavours themselves as also promoted in other domains like health care [16] and engineering [17], that is, emergency experts are going to voice their standard operating procedures in terms of process models. But we encountered several obstacles and setbacks when trying to establish process modelling as planning method in the emergency management domain.

3 Research Path

Our experience is founded in an array of projects with emergency related organisations including fire brigades as well as emergency management authorities, but also police and rescue organisations. These projects revolved around central aspects of emergency management:

1. *Utilizing BPM tools for SOP capture* – Modelling the operational concept for cross-regional support of mass casualty incidents (MCI) with prevailing BPM methods [18]
   This project delivered a proof of the usefulness of business process means towards emergency preparation. An already defined operational concept for the treatment of mass-casualties was translated into a formal process model, i.e. we transferred EM content into formal process models. This exercise demonstrated the virtues of formal process models, i.e. transparency across the organisation. Once processes are modelled by third-party experts, acceptance by domain experts has been high.
2. *User-centred process assistance* – Risk management process support for small to medium-sized communities for planning of natural or man-made disasters (project ERMA) [19]
   In the follow-up project we moved our perspective closer to the emergency management domain: we designed and implemented a process management modelling tool with a more intuitive interface supporting the terminology of the EM domain, but still founded in the look and feel of BPM tools (graphs with activities as nodes while edges presented the control flow). Hence, user acceptance improved due to the new interface, which was custom-tailored to domain experts' terminology.
3. *Re-engineering processes* – Mobile Data Capture and Communication for Emergency Medical Services [20]
   Another project studied the impact of mobile devices on the processes in particular once seamless information flows are possible. The process for capturing patient data has been the central focus. This process was re-engineered on the basis of seamless communication flows. Once third-party experts model the processes the actual notation language appeared of secondary importance. Now, we came closer to the EM domain: we created a mobile interface hiding the process modelling endeavour and just presenting the process execution results guiding rescue forces with a mobile interface. Still we faced the problem that the EM domain was unable to change the process itself.

4. *Planning support for emergency preparedness* – Process support for emergency management organisations in case of a long-lasting power blackout (project InfoStrom) [21, 22]
   The so far last approach was to move directly to the perspective of the EM domain: we elaborated a planning metaphor they already use, and formalised it in order to provide IT support: we framed a checklist model with a respective editor working in a network environment and employed converters to translate into BPM tools.

Even though we succeeded in providing the proof of concept that SOPs like MCI can be translated to business processes, the modelling method and tools –whether commercial or self-implemented– hardly engendered rapt enthusiasm among our emergency management partners. To re-iterate: they liked the modelling results, but disapproved planning process, tools and terminology. We undertook a critical follow-up research to find out why these projects felt a step short. Several indicators amid the projects were unveiled as potential reasons and are listed in the following section. Specific attention has been devoted to their classification along dimensions with regard to BPM as well as EM.

4 Juxtaposition of Process Management with Emergency Management Characteristics

The following table shows in summary the findings gained from our projects' experience. The left column spans topics of interest encountered while the two right columns relate specific properties and characteristics of both domains: emergency and business process management. It has to be noted that our findings are in some parts based on confessions and personal opinions of project partners working in emergency service agencies, rather than on a normative, scientific justification.

Table 1. Table of Different Characteristics

Topic		**Emergency Services World**	**Business Process Modelling World**
1. Planning philosophy	a)	Checklists prevail	Formal processes
	b)	No planning of big events	Focus on large-scale procedures
	c)	Liability questions	Transparency for quality
	d)	Secrecy and privacy of information	Interfaces with other organisations
	e)	Concentration on planning and post-processing	Concentration on planning, analysis and execution

Table 1. (continued)

2. Mode of operation, Practice and work	a)	Manual operation	Office automation
	b)	Improvements by exercises	Improvements by analysis and optimisation
	c)	No cross-organizational or collaborative planning	Design and operation of value networks
3. IT Technology, Implementation and Usage of Tools	a)	Unsteady abstract thinking, no modelling experience IT aversion or mistrust	IT and/or business-management user
	b)	Ease-of-use important	User interfaces crammed
4. Models and Concept	a)	Own, domain specific meta-model	Fixed, often standardised meta-model
	b)	Specific process features (escalation)	Escalation concept missing (turnaround required)
	c)	Incomplete, macro-structured, dynamic, ad-hoc processes	Static and complete processes
5. Organisational Issues	a)	Temporal units	Permanent units
	b)	Organizational changes due to phases	Mostly no organizational changes
	c)	Legal regulations for ranks and corresponding capabilities and authorization	Organizational model under-represented
	d)	Demographical and recruitment problems	Worker and terminology adapt to technology
6. Terminology	a)	Organization specific, traditional terminology Use of acronyms	Fixed terminology according to standards Business domain terms
	b)	Translations and explanation required for cross-organisational planning	No glossary No user specific interfaces
7. Goals and Decisions	a)	Concentration on strategic and tactical goals and its fulfilment	Goals underrepresented, analysis not according fulfilment of goals, but according business interest
	b)	Tracking of decisions in planning needed (why changes) Descriptions of reasons (legal rules, experiences made) needed	Only tracking of versions Text fields for further descriptions

We admit that the naming of topics and the assignment of issues to topics might formally not be orthogonal or are even overlapping. Our findings of differences are described in detail subsequently.

1. Planning Philosophy: a) Investigating the planning processes of German emergency services by analysing regulations, rules, directives, we surprisingly detected only rudimental process structures [22]. Checklists or task skeletons prevail that are sometimes even distributed across organizations. In all documents examined we did not found any formalisation or common notation presenting regulations or rules. They are kept as mostly unstructured text or checklists. Activities are hidden behind terms like "responsibilities" and "duties", which we believe could not be converted one-to-one to the definitions of business processes or activities. Rarely, any list of activities found had been sorted in temporal or logical order. What we detected is that most operating procedures of our fire brigades are described by means of checklists. Yet, most of them are merely paper-based documentation.

b) The operating procedures we found in regulations and handbooks are mostly generally described and not adapted to specific disasters. When asked, rescue forces, fire departments, and police agencies of our projects are arguing that in the majority of cases a large event can be broken down to a set of smaller events, which in turn can be handled "as usual". As such, only specific events are pre-planned, aiming to guarantee sufficiency of resources. An anticipation of "what could happen", "who will call when and why" does currently only take place, if major events are planned such as a soccer world cup or other happenings with such an anticipated high number of visitors. Another argument for not-planning we received from an emergency service of a commercial organisation (harbor). They argued that they do not plan for events which might happen, but have not happened yet, because of a waste of time and resources and because there is no regulation, which forces them to plan more than evacuation paths and contact persons details.

c) Also, an argumentation came up that one might be responsible for any damages or worse, cases of deaths, if a plan can be proved wrong by hindsight or if an actor deviated from such a predefined SOP (see also a discussion on standard operating procedures and resulting liability by Bentivoglio [23]). Such arguments turned out to be the reason for an often hesitant response of emergency units concerning formalized planning. Business actors, on the other hand, want to unveil problems for smooth operation in order to bring a product or service better to the customer.

d) Another problem we experienced was that responsible organizations do not want to expose their activities to other organizations; specifically fire brigades and medical services are tight-lipped due to data privacy, and police units due to matters of secrecy. But, to formalize procedures in order to unveil resource conflicts partners have to disclose what they are doing where and with what. This would allow emergency services to discuss their courses of actions and resolve potential conflicts (of goals, of resources etc.). Even our proposal of a careful selection or automatic filtering could not overcome the distrust; and we heard that the police are insulating their command and control systems understandably in general.

e) Emergency services we talked to were interested in planning support before and documentation of actions after the operation. A direct operation support

(means computer support during courses of action in operation) is still out of their scope: they say that most actions are manual tasks, any office automation is good for office workers but not for rescue organisations in the field. Simulation is done by training and exercises, and an analysis is made by evaluating the results of these exercises. BPM software on the other hand is used for process planning, analysis and simulation, improvement and finally execution in a product or service environment. However, we were surprised when staff responsible for the deployment documentation approached us with interest in mobile checklist support in order to initiate, track and finalize operation documentation on and in time.

2. Mode of Operation - Practice and Work: a) In many BPM applications the automation of processes is the driving objective, because process automation by information technologies saves time and costs. As indicated above, an overwhelming body of activities for emergency management is judged to be outside the scope of IT choreography. Hence, methods and tools for automation in the realms of process management do currently not affect emergency preparation and planning.

Most BPM tools are geared towards an automatic execution of processes as workflows. While doing so, this intention impacts strongly the methodology on how and in which order to model. Often, it forces users to enter details unnecessary for a non-automatic planning process. For the same reason, user interfaces are packed with complex functions, most of them unnecessary for planning without execution. We did not found any tools allowing one to scale up or down the interface according different application purposes. Consequently, our end users (fire fighters) were claiming that they are not able to use any BPM tools we proposed.

b) While companies analyze according to costs and resources, emergency management organizations try to improve their procedures according to tactical and operational goals and time until these goals are reached [24, 25]. But since their courses of actions are not ruled by predominant repetitions, they cannot stipulate and consequently inspect predetermined courses of actions in advance. Hence, they rely to date on exercises and subsequent expert evaluation.

c) The few emergency plans we found are concentrating on internal processes within the organisation, while external connections and relationships are somehow neglected or only superficially mentioned. A clear "when what who with whom with which means" is mostly missing. Moreover, if processes have been identified at all, they merely revolve around the rather abstract observe-orient-decide-act cycle in order to improve communications inside this cycle. Commercial companies reveal a quite different attitude. They try to open their operations in order to establish efficient and effective value networks interacting with partners, retailers, and consumers.

3. IT Technology, Implementation and Usage of Tools: a) We experienced that abstract thinking about procedures and then translating these procedures into a diagram of icons with computer software is still mostly too abstract for many local crises managers. Formalization and abstraction are normally not the business of "normal" fire department chiefs or respective staff responsible for planning. Not to forget that staff also comes from voluntary organizations and thus they are normally following a completely different business in everyday life. We often experienced that while we can easily translate the description of courses of actions in entities of the process

world, many persons of this domain struggle with this net of concepts and its logical linking. Thus, any tool support can only partly overcome the missing routine to abstract; we should allot a moderator or translator operating the tool, too.

b) We also detected that most BPM tools are somehow over-sophisticated offering hundreds of functions for different typical business operations: modelling, printing, sharing and loading, analysis, simulation, load paths, evaluation, documentation, import/export and so on. Taking into account that planning staff from e.g. fire brigades are not necessarily IT and modelling experts, learning on how to use such tools (with a completely different terminology as used in emergency services) is far too laborious and appears to be distant from the real work. Actually, some older staff appeared to be IT-adverse or computer-illiterate, but this might change when the smartphone- and Internet experienced youth succeeds them in position.

4. Models and Concepts: a) BPM tools describe a business process as a list of *functionalities*, triggered by *events*, executed by *organisational units* (referenced by *roles*, *positions*), passing and creating *information objects,* and linked by *connectors* allowing one to control the flow of functionalities, i.e. how functions are called (*and, or, xor)* (Example EPC [26]). Apart from different naming (for example, our fire fighters said they do not execute *function(alitie)s* or *processes*, they insisted on *carrying out measures*), they also have additional concepts in use like a *measure carrier* and a *measure carrier type* with *capabilities*, which can be derived from the *rank* and are necessary for a *position,* with each measure following *tactical* and *strategic goals* [24]. These models are similar, but obviously not identical. Further research has to unveil whether important and necessary information is lost when switching to such a standard business process model.

b) In an execution stance, concepts for dynamic control flow are required for the emergency management domain. One typical control flow element in emergency management is escalation (going from a lower alarm level to a higher) with a complementary de-escalation. Emergency management planning does cover different procedures according to different warning levels, be it flooding, storm, or rain with respect to gauge levels, wind speed, or precipitation rate. Procedures of a higher level often include activities of lower levels, increased or extended specific measures, and possibly replacement of resources or activities, if a level is skipped. The same goes for de-escalation, where activities have to be "reversed" step by step (e.g. evacuation of a hospital or rest homes). Currently, modelling and execution of such "escalation" processes is neither implemented nor in research investigated as far as we know. Such dynamic control flows are typically not part of prevailing tools for business process management. Although they can be implemented with so-called worklets for different instances of a sub-process in principle [27], more natural implementations are desirable.

c) The most decisive impediment of process modelling is the quest for completeness. A process model always claims by nature a complete understanding of the intended course of action without any discrepancy. Incomplete and partial models are not "valid" with regard to the philosophy of process modelling. Unfortunately, many courses of action in emergency management have to be prepared in a stepwise approach and call for customisation during the event [9], since "effective response to a

crisis is a combination of anticipation and improvisation" [28]. Although process modelling has given birth to adaptive and ad-hoc workflows, incompleteness and flexibility is still an open research issue.

5. Organisational Issues: a) Important differences revolve around the representation of the organisation and their units. While enterprises are mostly built upon permanent organisational units, emergency organisations rely on temporal units, with changing locations, roles, capacities, and the like.

b) Also, organisational changes might happen due to changes of phases caused by triggers [29] and this is limited supported by BPM or workflow tools [25]. Worse, some BPM tools often have only a rudimentary organisational model (for example, the BPMN standard only supports roles as pools and swim-lanes [30]). And if they have an organisational model, these tools expect a permanent assignment of persons to roles and positions. Capacities or capabilities are rarely elaborated.

c) In many instances, specific roles or positions require and also expect specific capabilities of a person by law or directives. On the other hand, resources sometimes require certain capabilities, i.e. only specifically trained persons can use a specific resource (e.g., rescue diver, rescuer from heights and depth, special crane driver).

d) While commercial organisations can easily adopt new systems and technologies (due to education in school and Universities, qualification measures and training), emergency service agencies with voluntary staff often have problems to train and educate their personal apart from emergency related issues. While companies select the person with the best qualification, voluntary organisations often have to live with the staff available regardless of general knowledge and qualifications. A responsible from a fire brigade told us off the record: "Well, we also have to work with staff, which works full-time as a forklift operator and has a helper syndrome. How to I educate him to think in terms of processes?" and how to train them to use and also to trust a computer.

6. Terminology: a) Most process modelling tools available stick to their own terminology and that is basically not changeable and not adaptable to other nomenclatures. This is inacceptable for somehow military oriented organizations like fire or police departments, who, even more difficult, also cultivate the use of acronyms for explicitness. They have to follow their own rules, legislation, and standards; a change of terminology could lead to confusion and failure especially with respect to the command structure.

b) We concentrated our research specifically on processes intersecting with processes of other organizations to unveil communication needs concerning use of the same resources (machines, places), mutual help, and the like. We focussed on these intersections, since they bear the most critical problems [31-33]. Thus, planners have to read and understand plans from other organisations, but ambulances, fire departments, and police forces use different terminologies, with –worse– also false friends. We obviously need translations and explanations of terms. Most BPM tools we know do not have any interfaces to something like glossaries or dictionaries.

7. Goals and Decisions: a) Underlying meta-models and analysis services of prevailing process management tools are tailored to business activities, not emergency management activities. Thus, they mostly suppose business interests of their users. To

give an example, these tools can analyse concerning resources like time and money, but not according the achievement of objectives or goals. Correspondingly, the underlying meta-models of the tools do not tackle goals or objectives adequately. But we learned that the fulfilment of tactical and operative goals is the core driver of operations in the emergency management domain. Although several criteria for process analysis appear crucial for rescue organisations, the ultimate question and criterion for process design remains unanswered: does my process adequately address the disaster? In order to address this question, strategic and operational goals have to be assessed and orchestrated rather than restructuring control flows in courses of actions. Unfortunately, the majority of methods and tools for process modelling do not support the elicitation of goals and objectives. At best, some tools support the representation of linkages among activities and respective processes with goals, but they do not support the networking of goals and their dependencies. For better collaboration of emergency services, different goals and their consequences have to be unveiled [34].

b) Since goals and their balanced consideration are of crucial importance, process modelling means have to be enhanced by means for unveiling design rationales [35] important for reuse and exchange of plans: who has changed which plan why? Independent of the lack of goal-orientation, leveraging the quality of processes is the driver for modelling processes, i.e. different users should implement a comparable level of quality. This certainly also applies to rescue organisations, which is perfectly illustrated by the definition and use of standard operating procedures for fire brigades and standard medical services.

5 Conclusion

Although process modelling for emergency planning has been utilized by many security related projects, essential questions about the applicability of process modelling concepts for emergency management practice have not yet been researched, e.g. does the functional design of tools for process modelling coincide with the way of working and thinking of rescue organisations or do the modelling concepts adequately address the objectives of rescue organisations.

Our experience suggests the conclusion that business process management methods and tools cannot be directly applied to the emergency management domain because of mismatches among tool support, intentions, organisational practices and experts' folklore.

To re-iterate, major impediments are:

- Available BPM tools do only fractionally support a change of terminology and never a change of model.
- Available BPM tools are typically targeting the automation of execution and this governs modelling method and user interfaces.
- The abstract world of process modelling is often incomprehensible for realistic and practical thinking rescue workers, fire men, and police men. Thus, they cannot use the BPM tools as is for planning. However, once courses of actions are modelled by process experts, processes become understandable and transparent for them.

Process modelling unveils laurels & darts for emergency preparation. Transparency and leveraged quality of courses of action are definitely a surplus of process modelling for rescue organisations. But what is needed is a more generic and more flexible approach for emergency management planning incorporating its specific peculiarities. BPM tools should at least allow a change of terminology and a modification of the model, should invest more in goal and organisation modelling and its analysis, and should provide a scalable, user-oriented interface leaving complexity to BPM experts or advanced learners.

Acknowledgment. This article was partly supported by the German Federal Ministry of Education and Research (BMBF) security research program and also partly by the B-IT Foundation. Special thanks go to the fire brigades of the City of Cologne as well as Rhine-Erft and Siegen-Wittgenstein County.

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Stakeholder Salience Changes in an e-Government Implementation Project

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Abstract. In this article we discuss in what ways an e-government project can give both expected and unexpected effects for agency employees and their working tasks. The purpose of this article is to illustrate the fact that, besides the aim to increase agency efficiency and citizen benefit, e-government implementation might also change the salience of involved stakeholders. We do this by focusing on one stakeholder group which was reluctant and hesitating in the beginning of the studied project; marginalized, passive, easily convinced, and old-fashioned. After the e-government implementation, this group had turned to satisfied, proud, influential, active, powerful, and modern IT users. The case shows how stakeholder salience might change over time in an e-government project. Stakeholder influence aspects and IT driven change aspects are intertwined. This makes it necessary for any e-government project to address the notion of stakeholder involvement in decision-making during the development and implementation phases, but also to acknowledge e-services force to change how things and people are perceived during these phases.

Keywords: e-government project, e-government implementation, stakeholder salience, IT driven change.

1 Introduction

Many studies of information technology (IT) implementation projects have focused on users' reluctance to use new systems and their resistance towards changes in working routines and processes [10; 11]. There have been numerous attempts to explain reasons behind such change inertia in IT projects [8] both in private and public sector. The argumentation has often been that reluctant groups are afraid of new things [14] or negative because they risk losing power, freedom of action or influence [2; 16]. These explanations of failure and success are applicable to e-government projects as well [5]. In this article we discuss a case which started out as yet another example of a group of agency employees being rather negative to the introduction of a public e-service and doubting their abilities to change work practices. However, during the process this group got a changed position. They went from being a marginalized group, in their own as well as in others' eyes, to becoming influential and modern IT users. We use this empirical example to discuss in what ways IT can give both

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 237–249, 2013.

expected and unexpected effects. By analyzing our case we show that an implemented public e-service, besides aiming to give benefits to different stakeholders, also changes the role of a professional group, this group's self-image, and the way other persons apprehend them as a professional group. This understanding renders implications for other e-government development and implementation projects, as it illustrates that technology can transform marginalized groups into powerful ones.

When discussing different stakeholders in e-government projects, we often distinguish between stakeholders with visibility and power to influence the result and stakeholders without such opportunities. Building on Mitchell et al.'s [18] argumentation, stakeholder salience depends on the stakeholders' degree of power, urgency and legitimacy towards a certain issue. In relation to e-service design and implementation, a truly salient stakeholder possesses power to influence the process, experiences it to be an urgent matter and has legitimate claims to get involved in the process. A stakeholder that has none of these three attributes is, on the other hand, not salient at all. Previous studies show that stakeholder salience differs over time in a project [7], but also that some stakeholders might remain invisible throughout the project and also afterwards [1]. Kamal et al.'s [7] study intends to describe four case organizations' perspectives so that other researchers can relate their experiences to this. Our study has similarities with Kamal et al.'s as both focus on detailed stakeholder analysis. However, we do not consider stakeholder influence to be the only affecting aspect in the studied case. Instead, we contribute with the notion of the interaction between stakeholders' possibilities to influence the project outcome and IT's force to change the state of things when introduced in a government setting.

E-government implementation projects often trigger changes in work practices and organization of work. When reviewing research in the information systems (IS) field, we identify many examples of changes that occur in work practices when IT systems are introduced or changed. Acknowledging that IT has the possibility to change how people perform their work tasks, how processes are (re)structured, and how work practices are organized has been central in IS research for decades. Despite being a well-researched area, Vaast and Walsham [25] point out that there are still few studies explicitly illustrating and discussing how IT use changes work practices. More detailed studies of stakeholders' IT adoption in e-government settings are also requested by Kamal, et al. [7].

The purpose of this article is to illustrate the fact that, besides e-government projects' aim to increase agency efficiency and citizen benefit, implementing public e-services might also change the involved stakeholders' salience. The article addresses this issue by studying how a marginalized, reluctant stakeholder group is involved in an e-government project in a way that actively influences the design of the implemented e-service. Together with these stakeholder influence aspects that turn the stakeholder from a reluctant user into an empowered and strengthened user, we find IT driven change aspects, which imply that the use of the implemented e-service also triggers changes in this stakeholder group's salience in the organization.

The article is organized in the following way: In Section Two we discuss a selection of views from previous research on stakeholders' roles in IT projects and IT's impact on social and organizational change. The research approach and case

study design are reported in Section Three. The empirical findings are presented in Section Four and in Section Five the findings are discussed. The article is concluded in Section Six.

2 The Roles and Influence of Stakeholders and IT

User reluctance and resistance towards new IT systems are often proposed to be reasons for IT projects' failure [8]. Signs of user resistance are likely to occur early in IT projects, expressed as fear and negative opinions towards the future IT system. Such user resistance and negative rumors prior to IT implementation are especially threatening to the project's success [15] as negative users might oppose and hinder the project to proceed. Leonardi [11] claims that users shape their views of new technology in various ways. Users discuss technology with colleagues and this influences their perceptions of it, but they also use the technology. The experience they get from using technology might change the perception they got from social interaction with others. These misalignments between the information generated in users' interactions with others and with the technologies' material features can lead to the failure of planned organizational change (ibid.). This is in line with Markus' [16] early claims that user resistance can be explained as the interaction between system characteristics and the social context of its use.

Besides the aim to define and explain reasons for user reluctance and resistance there are also many attempts to find ways of avoiding or decreasing it. The main theme in these studies has been to involve users, since the reluctance has been seen as a result of lack of information and users' deficient possibilities to influence the process and the outcome. If users are allowed to participate in the project, less user resistance are expected to occur [3]. Identifying and involving users and other stakeholder groups in IT projects is a key issue that relates to stakeholder salience [1; 18; 22]. Stakeholders might possess more or less power, urgency and legitimacy, as mentioned in the introduction, but participation in development and implementation projects might also change stakeholder salience. By inviting stakeholders to participate and by taking an active part in such work, a stakeholder group might increase their power in the organization and also perceive the project as more urgent.

User participation in IT projects has, thus, been proposed as a solution to the user resistance problem, but there is no definite causality between user participation and user satisfaction. Many studies question the effects of user participation regarding system success [4; 13] and discuss the paradoxes of participatory practices [e.g. 6]. System developers and managers might also have differing motives for promoting participation [9]. This implies that participation in itself does not necessary give all participants the possibility to influence the result. Sefyrin and Mörtberg [23] have studied a marginalized user group that participated in an e-government project, but still had no power to influence the outcome. In their case a group of administrative officers in a public agency possessed crucial knowledge for the IT project to succeed and was therefore asked to participate in the project. Nevertheless, they were not in any sense rewarded or recognized in the project. Instead, they risked being reorganized,

dismissed or offered an early retirement after the project had ended (ibid.). This is an explicit example of a participating stakeholder group that is not gaining any stakeholder salience due to their participation. The case, thus, shows that marginalized stakeholder groups might remain without salience even though they participate in the project; implying that there is no given causality between participation and salience.

This leads us from stakeholder influence aspects to IT driven change aspects. IT has the power to change what we do and how we perceive things [20]. As discussed in the introduction, many studies have focused on what happens when IT systems are introduced in organizations. IT implementation is done with some intentions to support users' work tasks which might include changes in work practices and organization. But not all changes are planned and expected. When IT is introduced, unplanned and unexpected changes of both positive and negative nature occur.

Among other challenges, Leonardi and Barley [12] outline that researchers need to study the relationship between IT development and use in order to understand how the practices of designers effect users and vice versa. When differentiating between development and use in order to focus on, for example, IT driven change aspects we risk to miss out important findings. Even though the IT system (or e-service) is primarily developed during the development project, continued development might occur when it is implemented and in use. This could be conducted either by the system developers who adjust the IT system according to the users' needs or it could be the users who modify the IT system during use (ibid.). This implies that user experiences can affect re-design, meaning that development activities continue after implementation. Likewise, studies of IT use that start after implementation often treat the IT system as a black box in the sense that the understanding of the development process is limited or comes from secondary sources. We use this as a motive for our study that ranges from development through implementation to use of an e-service.

Vaast and Walsham [25] explain how users might experience dissonance between their representations, practices, and IT use when they use IT systems in a context that is perceived as changing. In such cases, the users will transform their use of IT so that consonance is re-established. This is another explanation to the fact that changes occur both during implementation and use of IT systems. As shown in their (ibid.) study, the dissonance can occur due to perceived changes in the users' context (e.g., the work practice), but it can also be caused by changes in users' own actions or in other users' actions. A third explanation put forth, is that dissonance can arise from unintended consequences of actions (ibid.). By discussing this in terms of consonance and dissonance, Vaast and Walsham illustrate that we have to study users' understanding of their work tasks and IT system in order to understand how, and to what extent, IT use can initiate practice change.

3 Research Approach and Case Introduction

In this article we analyze findings from a case study performed at a Swedish university. We have conducted a qualitative, interpretive [26] study of a process where a public e-service for handling student anonymity during written exams has been developed,

implemented, and used. The project was called 'Anonymous Exams' by the university management. At the studied university, 100.000 written exams are administered each year which makes this an extensive process. The e-service that was developed to handle student anonymity electronically consists of several components; 1) one part handling the information transfer from a student administrative IT system to a mobile IT device (a Personal Digital Assistant – PDA) that is used on site during the examination events, 2) a web-based interface where students sign up for the exam and 3) another web-based interface that the teachers and administrators use when reporting the results. The case study covers several stakeholder groups which were involved in the development project and affected by the different components in e-service, but in this article we focus on one of these stakeholder groups; the examination supervisors. Thus, we also focus on the IT solution that was developed for this user group; the PDAs.

A single case study leaves us with no possibilities to draw statistically validated conclusions, but this is not our intention. Instead, we use the case in order to illustrate and discuss how stakeholder influence aspects and IT driven change aspects can interact and result in changes in stakeholder salience. Furthermore, an advantage with case study research is that a well-written case study has 'face validity' [19], implying that it represents a real story that people can identify with.

The origin of the initiative to develop this e-service was student demands for a higher legal certainty in the marking process of written exams. Students argued that the teachers cannot be totally fair in their marks as long as they know who the student is. Students were afraid that some of them could be "punished" with a lower grade if they had been critical towards the teacher or that some of them would receive a higher grade than appropriate because the teacher liked them. Thus, the student demand for anonymity is in line with a general strive for equal opportunities in higher education; i.e., no one should be discriminated because of his or her sex, age, sexual orientation, ethnicity, religion or other faith, disability or social background. The student demand for anonymity was articulated through the students' union and resulted in a strategic decision made by the university's vice-chancellor that an e-service should be developed to guarantee student anonymity during the marking process of all written exams. A project group was formed consisting of a project owner, project leader, systems developer, administrative personnel, representative of the examination supervisors and central examination administrator. A reference group was also organized consisting of representatives of the teachers, the students' union, and examination supervisors from all faculties. This implies that the following stakeholders were represented in these two groups; students, teachers, course administrators, examination supervisors, and the university (represented by the project leader, systems developers, and technical personnel).

The examination supervisors' task during the examination event is to monitor the students in order to control the process and prevent cheating. In short, the development, implementation and use processes that we have studied resulted in the following e-service and work process for the examination supervisors: The PDA is a mobile device that the examination supervisors use on spot during the examination event. At first, the examination supervisors load and sync the PDAs against a database

with information about which students that have signed up for the examination. The PDAs are equipped with card readers with which the Student Identity Cards can be read. When the students arrive, the examination supervisors can control that each student is in the right place by scanning these cards with their PDAs. The PDAs are designed to signal that the students have arrived to the right venue by producing an audio signal (a 'beep' sound). If a student arrives at the wrong venue, the PDA responds with a different audio signal. When the students are seated and handed their exams, the examination supervisors supply the students with their anonymous ID (AID) by scanning their Student Identity Cards once more. The students, and the examination supervisors, write the students' AIDs on the cover of their exams. When the students are done writing their exams, they hand in their exams to the examination supervisors. The examination supervisors scan the Student Identity Card with the PDA once more in order to register that the student has handed in the exam. After all students have handed in their exams, the examination supervisors synchronize the PDAs against the database once more. The rest of the process, in which teachers mark the anonymous exams and course administrators register the results before the anonymity is revealed, is not further discussed here. As will be discussed later in the article, this re-designed work procedure differs a lot from how the examination supervisors used to work before this project.

The case study was conducted from 2008 until 2010. During the pre-implementation phase, the authors followed the development project (the project group and the reference group) in their project activities. During the post-implementation phase the authors returned to the case in order to study the stakeholders' implementation and use experiences. Data was generated in several different ways. Six project meetings were observed and notes from these observations were taken. During the last project meeting, respondent validation [23] of the findings was accomplished. Data was also collected by observations of three information meetings open for university employees, one systems training activity for examination supervisors, and two evaluation meetings. 24 interviews have been conducted during the case study. The interviews lasted for 30-60 minutes and were recorded. In addition, project documentation as well as e-mails sent from university employees to the project group were analyzed. Responses to a qualitative, open-ended, questionnaire sent to all examination supervisors a year after the implementation were also analyzed. Altogether this case study design has resulted in rich empirical material focusing on the development project from several perspectives. The empirical data is of a qualitative nature and has been analyzed with an interpretive approach [e.g., 26].

4 Empirical Findings

The examination supervisors are contracted by the university and temporarily hired for each examination event. This group mainly consists of senior citizens (mostly retired women now working at a temporary basis) who want to earn some extra money. Their responsibility is to supervise the students during the examination event in order to control the process and prevent cheating or the use of prohibited aid. Prior

to the development of the PDAs, their work was totally paper-based. It was therefore obvious that this group faced the largest changes in their work tasks due to the e-service and the re-designed process. However, very few outside the project group were concerned with this fact, implying that the examination supervisors indeed belonged to a marginalized group prior to the project. In the pre-implementation phase this group expressed fears that they would not be able to learn the new process and how to use the new technology. The degree of IT maturity differed between individuals in this group, but was over-all low. The examination supervisors were afraid that the re-designed process would lead to increased time pressure during the examination, as the registration of each student in the PDA would take some time. Their greatest fear concerned how they were supposed to solve technical problems that might occur when they were alone in the classroom with a lot of students eager to start working with their written examination. They were not sure what kind of help they could get, and from whom.

Besides these fears regarding the transition from manual to IT based work, the examination supervisors also expressed positive expectations as they hoped to be able to influence the examination process when the e-service was implemented. For example, they hoped that the re-designed process would make it easier for them to refuse students, who have not registered for the exam in advance, to take part in the examination. These students are not allowed to do the examination, but the paper lists often contained invalid information and students' could claim that they were registered even though their names were not on the attendance list. In the new process the AID is generated when the student registers for the exam, and later retrieved when the Student Identity Card is scanned by the PDA, which means that no students could be permitted to participate if they lack this card and the prior registration. In spite of these positive expectations, the dominating feeling towards the e-service was fear. The examination supervisors were worried that the initial problems when introducing the new technology would last too long and that this could make some of them quit working.

Despite being characterized as a marginalized group in the organization, the members of the project group took the examination supervisors' expectations and fears seriously. They were worried that several of them would quit their job if the design of the work process and the e-service was not intuitive and easy to learn. Hence, the examination supervisors were seen as a user group whose needs and wishes had to be met to the extent possible. During training sessions organized for the examination supervisors close to the end of the development project, the participants were discontent with the design of the interface of the PDAs and protested against using the PDAs in their current design. Based on the examination supervisors' feedback on the PDAs, the interface was re-designed considerably late in the project. The examination supervisor representative in the project group was a strong driving force in this re-design of the PDAs and worked closely together with the system developer on this task. This representative turned out to be very important for promoting the examination supervisors' interests. She was selected as representative in the project group based on her formal position as an examination supervisor, but she turned out to be a real project champion with a lot of former experience in development projects.

In a questionnaire sent out to the examination supervisors when the re-designed working process and the e-service had been in use for a year, a majority responded that the PDA was an invaluable tool in their work and that they could not imagine going back to the old ways of working. Some individuals reported that they had been skeptical towards the changes initially, but that they now only had positive connotations to the e-service. The examination supervisors were very content with the training they had received on how to use the PDA and considered it to be easy to learn and use. They emphasized that the PDA was a useful tool for them and mentioned adjectives such as *"fast, smooth, supportive, easy to work with, professional, modern, and good"* in order to describe the e-service. Several respondents also reported that their work had become less stressful, safer and more trustworthy. Interestingly, the respondents also reported that their work required more precision and carefulness after the implementation of the PDA.

The main advantage with the new ways of working was that the entrance procedure had become less troublesome when using the PDAs. The examination supervisor could now see information about each student when scanning their Student Identity Cards by the PDA. Based on this information, the entrance procedure was now faster and easier than before; paper lists of the expected participants was no longer needed, and the audio signal from the PDA told the supervisor if the student was expected to participate and if she/he was in the correct room. Some respondents also experienced that the students' behaviour had improved as a result of changes; e.g., one respondent reported that *"Previously, unregistered students tried to sneak into the room or obstinately tried to maintain that they had registered for the exam even though they were not on the registration list. This behaviour has ceased."*

The overall view of the examination supervisors' perception of the PDA and the changed process is that they were very content with the ways in which it had all turned out. One questionnaire respondent wrote that *"It's fun; you feel more engaged, a few more tasks, also good for the students"*. Another respondent wrote that *"They [the students] probably didn't expect that an 'exam lady' would be able to handle a palm. We sort of have more authority now"* and *"Now when I know the routines I believe that the work is easy, I feel 'modern', somehow"*.

5 Discussion

Based on the empirical findings reported above it is obvious that the examination supervisors' attitudes towards the project and its outcome changed between the pre-implementation and post-implementation phases. In the beginning of the project, this actor group displayed a more or less reluctant and hesitating attitude towards the changes. It is easy to trace their doubts about their future work to fears of the new e-service and the re-designed process, which is a usual reason for people's reluctance towards change [14]. The feelings of fear were mostly connected to uncertainty of having sufficient skills and competence to learn how to use the technology. We do not see any signs of fear regarding, for example, risk of losing power, freedom of action or influence, which are other common explanations to change inertia [2; 16]. A possi-

ble explanation to this could be that the examination supervisors did not possess any power or influence in the organization prior to the project.

The situation that a stakeholder group, prior to an implementation project, is uncertain and afraid of not being able to cope with new demands, and then, after the implementation, experiences that this fear did not come true, is probably not unusual. Nevertheless, an IT project in general or an e-government project in particular might fail if such negative expectations take over and threaten the acceptance of the outcome [8; 15]. In the studied case the risk for this to happen was quite low since the examination supervisors as a group has few connections to other stakeholders. Their formal status in the organization prior to the project was low as they are temporarily hired on contract and rather easy to replace. Regardless of their position not being a potential threat to the success of the project, it would have been a huge drawback if many of the examination supervisors had resigned all at once. Thus, the fact that the project group recognized the examination supervisors as the stakeholder that faced the most severe changes in their work, and also being the group with least IT experience, was crucial. After the e-service implementation the examination supervisors express that they are satisfied with the changes. No one wants to return to the old working process and they claim that they are proud and enjoy their work even more than before. They changed their view of the project and the e-service developed and used, which resembles stakeholders' dynamic role as discussed by Kamal et al. [7].

When analyzing the examination supervisors' stakeholder salience, it is evident that at they did not possess the salience attributes [18] in the very beginning of the project. The IT project was not initiated as a response to any needs or requirements that this group initially had. On the contrary, the examination supervisors did not express any need for the new working process or e-service before the project started. Neither did they have any formal power to initiate such a project, nor would their claims have been regarded as legitimate. As mentioned above, this stakeholder group could instead be seen as a marginalized group in the organization in many aspects. However, early in the project, the examination supervisors were discovered as a group that would face much change and therefore they were focused and partly prioritized during the e-service development. In retrospect this might have several explanations; 1) the other user groups (course administrators, teachers, and students) were all difficult to engage in the project, 2) the system developer was particularly interested in developing the technical PDA solution, and 3) the examination supervisor representative was a strong force during the development phase. All these aspects interplayed in the same direction, making the examination supervisors become more influential on the design of the PDA than anyone would have expected from the beginning. This is a good example of the fact that stakeholder salience might change over time [1; 7]. During the project stakeholder salience of the examination supervisors increased radically from being a marginalized to an influential group. This can be explained by the interaction of their involvement in the development project and changes imposed by the implemented IT solution.

As a result of the re-designed process the examination supervisors' work content was completely changed. There are several new IT based operations that they now have to conduct, where the process before mainly was about ticking off a list and

watch for cheating students. The examination supervisors now apprehend their work situation to require much more precision and carefulness, which could be seen as a sign of increased complexity of the work content. Their part in the administrative process of written examinations has become much more active and transparent thanks to the e-service. This has changed the examination supervisors from being a passive guard of the examination event to possessing an active and important role in the university's educational processes. These changes have nothing to do with the influence the supervisors had on the PDA design, which was focused on interface and interaction issues. Instead, this is a consequence of the changed working process in combination with the new e-service. This is an illustrative example of how technology-driven organizational change activities might occur and be viewed from different perspectives [15]. It is noticeable that none of the changes in the working process were implemented in order to reach these benefits for the examination supervisors. Nevertheless, they did occur and are appreciated as positive aspects of the changed work content. This is also an example of a beforehand unintended, but realized benefit [17; 20]

One aspect of the above mentioned changes in the examination supervisors' working process is that these changes not only influenced their notion of work satisfaction. The changes also made the students look at the supervisors with new eyes. Prior to the project, some students had tried to convince the supervisors to let them participate in the examination even though they had not registered their attendance prior to the examination. They begged, yelled, and even lied in order to be able to write the exam. This was a true problem for the supervisors, who before the implementation mentioned that a possible benefit from the project would be to gain more authority towards students. Thanks to the PDA and the changed administrative process this expectation came true. The supervisors now experience that the students obey them much better and that they apprehend them as more legitimate and powerful. Hence, the examination supervisors' role towards students has changed.

Changes in how others, in this case the students, view us also influence how we perceive ourselves. What started out as the examination supervisors' main source of concern – being able to handle the PDA or not – turned out to be the key element in their positive judgment of the outcome. After the implementation phase it was the use of the PDA that was emphasized as most positive, both regarding its usability and its implications for the process being safer, more trustworthy, and efficient [cf. 21]. They explained this as a transformation they had gone through from being a technology hostile 'exam lady' to a modern IT user. They commented upon the fact that this had also influenced their relation to technology outside their work. This could be seen as an example of dissonance [25] between the re-designed process and the e-service, on one hand, and the old image of the supervisors on the other hand. Maybe it was this dissonance that made the supervisors start viewing themselves differently and, consequently, also acting with more authority. The result was, regardless, a changed self-image.

6 Conclusions

In this article we have shown how a marginalized stakeholder, who in the beginning of an e-government implementation project lacks power, urgency, and legitimacy, still can turn into a salient actor during the process. We have identified several types of change related to the studied stakeholder group. They changed the way they viewed the project, going from a reluctant and hesitant attitude to a sense of satisfaction and pride with their PDA and working process. The examination supervisors started this journey as a somewhat marginalized group that did not have a prominent role in the planned project, but was prioritized by the system developer who at a late stage of the project involved them in the design of the PDA. This made their stakeholder salience increase during the project. In the old process, the examination supervisors mainly served as a passive guard making sure that the process and the rules were followed. After the e-service implementation the supervisors were empowered with distinct assignments as an important and legitimate actor in the examination process, thus, the work content had shifted [cf. 15]. As results of these IT and process related changes, both the role of the supervisors as apprehended by others (the students) and their self-image changed. They went from being a marginalized and reluctant stakeholder to an influential and modern IT user.

The purpose of this article has been to illustrate the fact that, besides e-government projects' aim to increase agency efficiency and citizen benefit, implementing e-services might also change the salience of involved stakeholders. We have done this by focusing on one stakeholder group's transformation during an e-government project. The main conclusion from this case is that in e-government projects we need to acknowledge both stakeholder influence aspects and IT driven change aspects in order to understand the effects and consequences.

Finding ways to involve stakeholders and making them influencing the design and development of e-services and working processes is an important but complex task, since there are many stakeholders with differing needs and possibilities to participate in e-government settings. This study shows that stakeholder involvement in itself is not enough since both intended and unintended IT driven changes will occur during and after the project. Stakeholder influence aspects and IT driven change aspects are intertwined. This makes it necessary for any e-government project to address the notion of stakeholder involvement in decision-making during the development and implementation phases, but also to acknowledge IT's and e-services' force to change how things and people are perceived during these phases. The view of a planned and rational change project is here challenged by an emergent, dynamic, and intertwined process [cf. 17].

We have illustrated these matters by a "successful" case, in which a marginalized group turned out to be a winner in the end. Next step would be to study less successful cases in order to find out if the intertwined relation between stakeholders and IT works in both directions, turning marginalized actors into powerful ones but also decreasing authority and prominence among others.

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Facilitating Adoption of International Information Infrastructures: A Living Labs Approach

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Abstract. One of the key challenges that governments face in supervising international supply chains is the need for improving the quality of data accompanying the logistics flow. In many supply chains, individual parties in the chain work with low quality data for their operations and compliance, even though somewhere in the supply chain, better data is available. In the European CASSANDRA project, ICT-supported information infrastructures are developed to exchange data between businesses and government, to support visibility on the supply chain and the re-use of information. However, to gain better data, actors need to be open about their operations, processes and systems to parties that are geographically and culturally on the other side of the world. This adds (perceived) vulnerabilities for parties already operating in a highly competitive environment. This could be a major barrier for making the innovation work. We argue that Living Labs, as a collaborative innovation approach, are able to support the adoption of innovative information infrastructures. They help identifying gains that innovations may bring. Furthermore, the trust-based setting also mitigates the added (perceived) vulnerability such innovations bring for the participants. We illustrate this by examples from the CASSANDRA Living Labs.

Keywords: Data quality, supply chains, public-private information infrastructures, living labs.

1 Introduction

The main topics in government supervision of today's international trade are efficiency and security. Outsourcing, consolidating cargo and multi-modal transport chains have complicated the organisation and optimisation of logistics and have put additional challenges to managing information and data in these logistics chains. In addition, the information system in international logistics is much influenced by its own legacy, and as a result, documents that originating from the 19th century are still being used. Results of these complications can easily be found: carriers and importers are being asked to make legal declarations about goods they have never seen,

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 250–261, 2013.

documents that contain crucial information can lag three days behind the goods, and these documents contain information that obscure the true values, such as the identity of the real seller or buyer. These issues have a common solution: supply chain visibility, where data can be shared between business and government, providing end-to-end visibility for all stakeholders, where information can be provided by the originating party and re-used by others. This should result in a significant reduction of transaction costs while it also improves the information quality when advanced mechanisms are used for data capture and cross checking data from various sources. However, this can only be realised when government inspection agencies and the business community work together.

With the advancement of technology innovations it becomes possible to improve the information exchange worldwide, by creating electronic connections between organisations [1]. Data can be made available digitally and is instantaneously available to supply chain partners, and authorities around the globe. However, a wide range of complexities arises. Gathering, sharing and combining information from various sources requires the development of *information exchange platforms* that are used by a wide variety of stakeholders having diverse interests [2]. Both business systems and digital government infrastructures are connected to each other, owned and operated by a diverse set of public and private actors. The technical complexities of implementing these platforms is compounded by the number of stakeholders affected by and involved in the decision making process. For such a platform to work in the dynamic context of international trade and logistics, the system needs to be flexible, heterogeneous, interoperable, and above all entirely secure. The use of such platforms also introduces new complexity and new uncertainties for the parties involved, due to increased interdependence and potential vulnerability [3, 4]. Ultimately, this requires the collaboration of many different stakeholders that will have to make a strategic decision on the willingness and necessary investments for sharing information about their processes, products, etc. A perceived increase in vulnerability due to this kind of innovation may hinder industry uptake.

In this paper, we present the experiences from the Living Labs (LL) approach used in the CASSANDRA project. The LLs fosters collaboration between the parties in a small group community for a specific supply chain. As a result, this group, operating in a neutral Living Labs setting, is able to build inter-organisational trust that allows the various parties to assess their supply chain from an end-to-end perspective and openly discuss activities, logistics processes, information processing and production, data requirements and how this may be disclosed to others. Consequently, benefits or business cases may be realised that go far beyond the initial quest for better data and move towards more sophisticated use of the electronic links that are formed between parties [5]. We show how the Living Labs enable parties to find these more sophisticated uses by creating a trusted setting that counters the added vulnerability that is introduced by adopting an information exchange platform to electronically connect to partners in the supply chain [3].

2 Background: Data Exchange Infrastructures and IOS Adoption Concepts

2.1 Data Exchange Infrastructures in International Trade

The research and development project that we focus on in this paper aims to improve efficiency, security and compliance in international trade and logistics by integrating information flows on goods, actors, (commercial) contracts and logistics (e.g. transportation). Both the businesses in the supply chain and supervision authorities gain enhanced visibility benefits based on better quality information, in terms of accuracy, timeliness and completeness [2]. This is even more so if enhanced data quality is combined with innovative information integration and visibility, tracking and scanning technologies and linked to operational risk management [1]. In addition to addressing supply chain inefficiencies, businesses can employ this high quality information to facilitate compliance.

This innovation requires the business community to consider the supply chain from end-to-end, with special attention for data quality and the processes from where the data originates. This is the concept of 'data from the source'. Depending on the configuration of a specific supply chain and who is executing which activity, different parties may be best equipped to provide certain data elements that can be re-used by other parties as well. For example, a purchaser of goods knows which goods were ordered, in what quantity and for what value. But a logistics service provider that performs container stuffing may be actually matching the order with the container manifest, thus providing better quality data on the shipment and the contents of the container, which is then the basis for other logistic activities and many (legal) documents along the chain.

To enable the wide variety of actors in the supply chain to share data amongst businesses and between the business community and government agencies, ICT infrastructural facilities need to be developed. Hanseth et al. [6] depict these infrastructures as information infrastructures to emphasize a more holistic, socio-technical and evolutionary perspective to place the growth in the combined social and technical complexity at the centre of an empirical scrutiny [7]. Realising these infrastructure requires transformations, i.e. meaning radical changes in core processes within and across organisational boundaries [8-11]. Organisations that have implemented information integration solutions have reported significant benefits that support the IT/IS evolution process [12].

The European CASSANDRA project proposes a solution for an innovative information infrastructure for international trade, called the *data pipeline*. It is a concept based on the use of Service-Oriented Architectures (SOA) to enable access to the existing information systems that are used and operated by the various parties in global supply chains [2, 13]. It is a virtual bus, created by linking ERPs, existing inter-organisational trade and logistics platforms connecting e.g. port and business community platforms, and systems for tracking, tracing and monitoring the goods [13]. The data pipeline provides one integrated access point to the different sets of information that already exist, but are currently fragmented throughout the supply chain.

However, to set the right requirements for a data-sharing platform, the parties literally need to sit together to share and assess the end-to-end supply chain and data availability and quality, e.g. does the data originate from a standardized and verifiable process; was it made available by manual entry, or automatically from an ERP system? Due to competitive pressure, these parties normally do not discuss this as part of their normal day-to-day operations. As a result, any ICT innovation to improve end-to-end supply chain visibility has a high risk of failure due to focusing primarily on improving data sharing techniques and standards, without making an in-depth assessment of the best data quality sources in each individual supply chain and the challenges in gaining mutual trust and cooperation.

2.2 Inter-organisational Relationships in IOS

The data pipeline can be considered an inter-organisational information system (IOS), as information crosses the boundaries of individual parties and data and (potentially) functionality is being shared between organisations [14]. Most early literature considered a lead party (or 'sponsor') of an IOS, which has an important role in defining its functionality, the participants and funding structure of the system [14]. However, given the complexity in international trade and logistics, all parties (and thus potential 'sponsors') also depend on supply chain partners to realise the expected or intended benefits by introducing, supporting or otherwise sponsoring the system. Therefore, the adoption of an IOS, and the factors influencing adoption, is a key research topic [15, 16].

In studying the factors that influence the adoption of Electronic Data Interchange (EDI) as a form of IOS, Chwelos et al. [16] seek for factors at three levels; the technology, the organisation and the inter-organisational level. In the findings of their empirical research, there are two parts that stand out in determining the intention to adopt an IOS; the external pressure and the readiness. The external pressure consists of both competitive pressures and enacted pressure from the trading partners. The readiness concerns the financial resources and the IT sophistication, including management support, which a party needs to adopt an IOS. As due to its nature an IOS only works if other partners also use the system, trading partner readiness was also found to be of importance.

The contemporary field of information or digital infrastructures, which can be considered a direct successor to the IOS studies, puts more emphasis on the inter-organisational aspect. They focus on the role that socio and political factors play in enacting, adopting and supporting information infrastructures [17]. Here, information infrastructures are seen as an open, heterogeneous, evolving and IT facilitated socio-technical system that is shared between multiple actors [18].

In their 1997 paper, Hart and Saunders emphasise that IOS innovations lead to new complexity and primarily new vulnerabilities for organisations that adopt an IOS through the increased interdependence [3]. They take the existing relationship between parties as the starting point for their reflection. The way in which innovation impacts the existing relationship and the way in which parties treat each other in the innovation, determines the extend of the potential future benefits of the innovation.

2.3 Building Trust for Depth of Use of the Innovation

The three main elements of Hart and Saunders' thesis are power, trust and vulnerability. They argue that although pressure can be used to stimulate adoption of an IOS, this can also negatively impact the relationships between parties. This is because the perceived vulnerability of the partners increases. An IOS enables information to cross the boundaries of the organisation [3]. Trust, in this context, means that parties need to be confident that their partners do not misuse the information they gain in the IOS, nor exploit the increased vulnerability. If trust is built, there is a tendency to continue the collaboration. Hence trust and continuity are mutually reinforcing. Ultimately, this is important in order to gain the maximum benefits of the IOS as the innovation often starts with only a small transaction set, often with a limited number of parties. Based on the work of Massetti, Hart and Saunders [3] argue that there are various characteristics to the use of an IOS:

- Breadth of use, i.e. the number of IOS partners;
- The diversity of the transaction/document set;
- The volume of transactions via the IOS;
- Depth of use, i.e. first just electronic document transfer, deeper use is inter-organisational application to application transfer, next is interconnected or shared databases and ultimately up to coupled or shared (automated) work environments.

The more the IOS is used *in depth*, the greater the vulnerability of the parties opening-up to each other. Furthermore, Hart and Saunders argue that most parties start with simple exchange of documents, and at the time of adoption of the IOS do not yet foresee to what extend the IOS will impact their future operations and collaboration. The expectation is that more benefits can be gained if the integration is more in depth. The principle that trust and continuity is mutually reinforcing is reflected in this gradual implementation of IOS.

In this paper, we argue that a Living Lab research and development approach can help in facilitating a safe environment and facilitate building inter-organisational trust, which enables parties to design, implement, adopt and evaluate the use of an IOS. The Living Lab setting especially enables commercial partners to move beyond arms-length trading relationships and collaborate more to discover shared benefits of introducing the IOS.

2.4 Trust and the Living Labs Approach

Hart and Saunders use the classification of Mishra [19] to identify four dimensions of trust in the context of sharing information in an IOS:

- Competence: partner is able to process information properly and efficiently;
- Openness to innovation;
- Care: no misuse of new interdependence and vulnerabilities; and
- Reliability, i.e. actors do as they say.

In this paper, we state that a Living Labs approach is not only a valuable research and development tool to put innovative information infrastructures to practice, but also creates a setting that facilitates trust, which is what we focus on. It enables the various actors to gain confidence that the innovation can indeed help in realizing mutual benefits, and that the partners will not act opportunistically and misuse the vulnerability.

A Living Lab is defined as a "gathering of public-private partnerships in which businesses, researchers, authorities, and citizens work together for the creation, validation, and test of new services, business ideas, markets, and technologies in real-life contexts" [20]. Continuity, openness and empowerment of the actors are three of the key principles that Bergvall-Kåreborn et al. [20] identified with respect to Living Labs. A returning aspect of Living Labs is the crucial, and high level of collaboration, enabling to build inter-organisational trust [21]. Limited trust and collaboration will inevitably result in sub-optimized designs and solutions, no commercially valuable resulting services and no valid proof of concept. Innovation through Living Labs is therefore only possible when partners aim for collaborative innovation.

With respect to governance of choice for new solutions, it is crucial that Living Labs are open and neutral with respect to technology or business models. This is needed to get the most out of a collaborative innovation process, "by avoiding the problem of path dependency & lock-in and at the same time optimizing interaction among organizations" [22]. Consequently, Niitamo et al. [22] argue that a Living Lab needs to bring access to state-of-the-art technology, which is diverse, i.e. not just one technology, but competing technologies that are delivered through different business models. Hence, on the technology side, cooperation with (and between) technology vendors is necessary, including both SMEs and larger firms [22]. When asking investments of these directly competing companies in creating innovative products, creating an environment of trust, cooperation and willingness to teach and learn together, is also one of the crucial factors of success and first points of attention when setting up a Living Lab.

Compared to other test and experimentation platforms, e.g. prototyping platforms, testbeds, field trials, market pilots and societal, Living Labs have a higher level of design focus [22]. In Living Labs more efforts are being put on the design phase, resulting in less commercial maturity at inception, but on the other hand, the end solution should better fit the requirements of the users and therefor have higher chances of success in the long run. Because of all complexities, it is evident that the goal of the Living Lab study needs to be clear and equally understood by all participants at the start of the project. If this is not the case, it will become increasingly difficult to create an environment of trust and end up with having the right focus and commitment of the individual partners, that each have their importance and contribution.

3 The Living Labs Approach

Within the Living Labs of the CASSANDRA project, actors from business and government cooperate to develop and evaluate new ICT solutions that support

international trade, logistics and compliance in a real-life pilot setting. These partnerships are facilitated by the research environment, where partners from academia and other research institutions provide a "neutral ground" for the interactions, aiming to initiate and facilitate processes of consensus building, networking and policy making.

3.1 Select Demonstration Trade Lanes

First step in setting up the Living Labs was the identification of suitable trade lanes. A trade lane was defined as a single lane from origin to destination, from a specific seller to a specific buyer, across fixed transport modes. These trade lanes were selected with the business partners based on flow and process stability, and relationship with the trade lane partners. After selection of the trade lanes, the next step was to assign a dedicated IT solution provider to the trade lane. This was important as it also made the solutions that would be tested in a trade lane more specific. Choice for a solution provider was driven by various factors such as estimated maturity of IT in the trade lane, specific requirements by business partners on the trade lane, geographical presence and the need to end with a set of demonstrations that would have enough variety to support scientific research and a good basis for calculating the final results in the overall evaluation of the CASSANDRA solutions, including an extrapolation to the industry at large of logistics, international trade and compliance. The closed user groups, or trade lane teams, took form.

3.2 Creating Mutual Understanding

The next step to work on a common level of understanding, which in case of CASSANDRA included getting acquainted on a personal level, understand each other's businesses and interests and the detailed processes and products. This was established in a workshop with local trade lane partners to get a first mapping of the trade lane's parties, processes, IT implementations, etc. This was done in working sessions where process mappings, dossier analysis and interviews were performed. Coming to the necessary level of understanding in the CASSANDRA project was a challenge for the partners that are less acquainted with the supply chain processes as the principle of getting data from the best or even original source means that a detailed knowledge of processes, resulting information exchange, and data control mechanisms is needed.

In this stage, the team got a first common understanding and importantly a common mission is finding answers to the unanswered questions. Much of these answers were found in team trips to the other ends of the trade lane (i.e. Asian countries). Here, supply chain parties were visited, interviewed, possible solutions discussed, etc. In many cases, earlier assumptions, sometimes with 99% security upfront, turned out to be incorrect. Parties that have been working closely for many years, never got to talking about such details. There was an open and collaborative attitude towards the supply chain partners. Meetings never resulted in a closed attitude from either side, but almost without exception in open and animated discussions. In many cases, the group expanded with experts from the partners (literally on the other side of the

world), bringing their expertise and dynamic to the team. Working in a Living Lab setting opened up possibilities to discuss operations openly. As a result, businesses learned more about the way their partners operate and the sources of the data they worked with in a day than they have done in years of collaboration before.

In the next chapter, we describe findings from the recent Living Labs, making it at this stage not possible to assess whether relationships lasted or if IT solutions reached commercialisation.

4 Findings from the CASSANDRA Living Labs

Within the CASSANDRA project, there are three Living Labs that share a common end vision, solution providers and project partners, but also each one has its own specific user group, regional characteristics, level of IT maturity and stakeholder community. In terms of building inter-organisation trust, this gives additional complications as a larger group of partners, that not only bring specific expertise but also different backgrounds, need to collaborate and agree on a final solution. Therefore, it was agreed upfront that local implementations of the solution might differ according to the needs of local stakeholders. To detail the overall vision and simultaneously start Living Labs from a bottom-up approach brings an additional complication in realising and aligning project and Living Lab goals. Coordination of these two levels needs to be a joint effort of a dedicated smaller group of people that can continuously monitor development and targets and that clearly steers and communicates. As this also transforms the way government agencies operate, and digital government infrastructures are part of the overall information infrastructures, government needs to be involved from the beginning.

Due to the project schedule, various trade lane options were selected and a lack of understanding existed on the potential benefits for the various supply chain parties that were asked for support. The trade lanes where this problem did not occur, had the advantage that these were already used in earlier research projects, or there was involvement of strategic, long term partners and customers of the consortium members.

4.1 Building Trust through Open Collaboration

Within the trade lane teams it was easier to build a high level of trust and collaboration since most partners in the logistics chain are already acquainted over several tiers and the project provided them with a neutral discussion platform. It might have been beneficial that the coordinating partner in most of the trade lanes was a neutral knowledge institute. Involving solution providers in the various trade lanes, already in the first stages, also supported trust. First, because the team worked jointly on a common understanding of trade, logistics, compliance and possible solution. Second, because there were only a limited number of external parties, being the solution providers, that needed to get acquainted with the trade lane and the more or less confidential data related to it. Third, the solution providers in the trade lane were

chosen as such that there were not competing but cooperating. This also stimulates knowledge sharing between solution providers.

4.2 Trusted Setting Enables Depth of Understanding and Potential Use

Defining the information requirements of the various stakeholders and designing the solution is less of a challenge, provided that the partners have got acquainted and all have the same understanding of the processes, the problems to be solved and the possible solutions. This is complicated by practicalities from the international character of the topic. Supply chain parties sometimes know each other only by name, are affected by complex relationships due to the different levels of contracting in international logistics, and have no ability to meet face-to-face regularly to know each other well enough to be convinced of mutual understanding. Furthermore, having a common and complete understanding of end-to-end supply chains means that all parties need to understand both the physical and administrative processes of shipping goods around the globe. This includes not only the business side of these processes, but also compliance processes, interests of inspection authorities, and the systems that support these processes and potentially offer relevant solutions.

The exercises that contributed to this common understanding have proven to be of great importance. First, it showed a project partner, that was working closely for several years with an overseas party, jointly developing new logistics services, was completely unaware of the existence of an IT system that holds all the forwarding information. This system only came to the team's attention after a day of discussion at the forwarder's premises in Asia. The system proved to be essential for data capture in the project. Sharing this data, instead of the information they exchanged before, enabled the project partner to significantly improve their operations, including warehouse planning, and enhance their service level to their customer.

Second, the trips overseas also brought more understanding of logistics processes for the partnering authorities. Existing control mechanisms in supply chains, such as the use of a tallyman during container stuffing, can be a crucial indicator of a supply chain being in control. Information about these control mechanisms can support compliance and risk management.

Getting a common understanding of the trade lane required the whole team to be able to work on various levels of detail at the same time, understanding each other's detailed processes and products without losing the bigger picture and effects on the final solution. A Living Lab approach requires a certain set of skills and competences, both analytical and social, for its participants as well as the coordinator. The role of the coordinator in these sessions is to bring the participants together on a social level but also on a content level. The coordinator therefore needs to have basic understanding of the various perspectives and being able to work as a translator and moderator in discussions. When a Living Lab includes a public-private partnership, this is another dimension to the standard complexity. It is essential to formulate the constraints and incentives imposed by authorities to keep the discussions focused and within their legal frame. This is important to steer the project's efforts in a direction which results in not only a technically viable solution but also a solution that fits in current policy, and as such is acceptable and accessible for the market after the project ends.

Managing a public-private partnership in Living Lab innovation requires both public and private parties to reach a certain level of understanding and trust which is much influences by the power relation that naturally exists.

4.3 Supporting Depth of Use Creates Bigger Advantages

In the example mentioned earlier, the Living Labs setting enabled the business community in the trade lane to identify better sources of data. This is partly a result from the collaborative approach, as the Asian owner of the information system did not know what the use their partners on the other side of the world could have for their data. At the same time, being able to connect this data source to the inter-organisational data sharing system was also a result from the trust-basis created in the Living Lab setting. The information system owner got in-depth information on the way the information would be used, and what the supply-chain-wide benefits could be. For them, this mitigated the perceived risk that the information would be used opportunistically. They saw how it could instead strengthen their existing relationship with their European partner. Sharing the information through the IOS enabled them to increase the information exchange and the efficiency of the supply chain as a whole, instead of optimising the individual steps that any single party could control.

The careful assessment of where data comes from, and the finding that this party could provide information from primary records, also enables benefits from compliance and governmental inspection perspectives. As the customs organisation got a better understanding of the source of the data and of the way that the business community themselves asserted its correctness (i.e. data from the source, combined with a tallyman), they are able to assess the security of this supply chain as a whole. This may result in a decrease of the inspection burden that was caused by incomplete or inaccurate information at import.

5 Conclusion and Discussion

The development of information exchange infrastructures for international trade and logistics is a complex undertaking. Much of the data that is important can come from multiple sources and is often altered, inaccurate and sometimes intentionally vague. To gain better data on global goods flows and thereby enhance the visibility on those flows in an inter-organisational information system or IOS, just interconnecting systems is insufficient. The stakeholders need to provide detailed requirements and specifications for such a system, meaning that knowledge is needed on the source of the data, the processes in other organisations that produce the data, existing control mechanisms and the various IT systems. With this, they are able to assess the quality level that is needed for each data element on what point in time, and of the quality level that each partner and system can provide. .

Aspects that can influence innovative developments in this area are external pressure, readiness and the trust and relationship between partners. The more the IOS is used in depth, the greater the vulnerability of the parties that are opening-up to each

other and the higher the need for mutual trust. This already starts in the specification phase, where discussion requires openness on operations, processes and systems to parties that could geographically and culturally be on the other side of the world. Parties might perceive to be vulnerable when opening up, especially since they are operating in a highly competitive environment. Living Labs offer the possibility to create a safe environment in which parties can create sufficient mutual understanding and trust to perform the crucial first steps in specifying the requirements for an IOS. The idea that trust and continuity are mutually reinforcing also reflects the crucial success of these first steps in a gradual implementation of IOS. Therefore, we argue that the small user group innovation in Living Labs are not just a good instrument to get this done in a research setting, but also to support the eventual adoption of the information infrastructures and support the required transformation. Such a collaborative innovation approach gives the ultimate adoption a boost by focusing not just on the benefits that parties can gain from the innovation, but also respects and deals with the added (perceived) vulnerability that such innovations bring for the participants.

The examples from the CASSANDRA Living Labs show that working in dedicated teams can work really well in creating an open and safe environment. The lessons learnt show that a specific, shared and well-understood objective for the cooperation is crucial for selecting the team and also final success. Working jointly on a common understanding of the trade lane and the stakeholder's needs not only brings knowledge but also improves the relationship and team spirit. The people working in the team need a certain set of competences and skills in order to create this positive atmosphere and work effectively. Also, the role of the neutral coordinator is important to moderate the discussions and to facilitate mutual understanding with necessary functional translations. The common understanding is the crucial starting point for developing a common roadmap to implement an IOS for a group of organisations.

Acknowledgements. This paper results from the CASSANDRA project, which is supported by funding from the 7th Framework Programme of the European Commission (FP7; SEC-2010.3.2-1) under grant agreement no. 261795. Ideas and opinions expressed by the authors do not necessarily represent those of all partners of the project.

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Examining Sources of Resistance to the Implementation of a Patent Management System in a Developing Country: Evidence from a Case Study of the Brazilian Patent Office

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Abstract. User resistance to information systems implementation has been identified as a significant reason for the failure of new systems and hence needs to be understood and managed. While previous research has explored the reasons for user resistance, there are gaps in our understanding of how users evaluate change related to a new information system within patent office organizations. This paper explores the sources of resistance associated with the implementation of a Patent Management System (PMS) at the Brazilian Patent Office, which is named ´Instituto Nacional da Propriedade Industrial` (INPI). This study investigates typical types of user resistance together with strategies for overcoming these resistances. In the case under analysis, the study shows that resistance to the PMS caused a delayed adoption of the system and the main motives for resistance were: the employment relationship and the perceived interference of the system with the power and autonomy of the patent examiners.

Keywords: Information systems, resistance, patent office, implementation.

1 Introduction

As the value of companies is increasingly determined by their ability to innovate, the protection of intellectual property (IP) assets has become absolutely paramount in the current knowledge-based economy. Consequently, since a patent office enables the protection of inventions through patents, it is becoming an essential public institution in supporting enterprise value creation. In fact, two essential objectives underlie a patent office. On the one hand, it promotes more investment in research and development by providing a monopoly to the inventor in exploring the invention [22]. On the other hand, it encourages the disclosure of inventions so that others can use and build upon research results [7]. According to van Pottelsberghe and Mejer [25], the operation of a National patent office affects directly the credibility of the patent examination process and, as a consequence, the demand for patents by firms. Hence, this type of public organization is constantly seeking to improve efficiency and effectiveness of its operations [2; 25].

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 262–273, 2013.

Accordingly, over the past decades, Information and Communication Technology (ICT) has been largely adopted by patent offices throughout the world as an instrument to enhance execution of business processes. In practice, the ICT solutions adopted by these offices are often referred to as e-government solutions. Based on that, this research has adopted the e-government definition proposed by Stanforth [24], which defines e-government as the socio-technical arena within which information and communication technologies are applied to organize public management in order to increase efficiency, transparency, accessibility and responsiveness to citizens.

Although governments are traditionally considered more conservative entities, slower to adopt new initiatives than players in the business realm, various authors recognize that there are many opportunities for developing e-government applications [16; 4; 18]. In the particular context of e-government, there is a widespread consensus that knowledge about public information systems has turned into a critical resource for public organizations [24]. As such, given the scale and complexity of their operations, patent offices are characterized by their extensive use of ICT.

However, user resistance to information systems implementation has been identified as a significant reason for the failure of new systems and hence needs to be understood [12]. A primary assumption is that information systems frequently embody a distribution of intraorganizational power among the key actors affected by its design [17]. So far, the extant literature in IS has widely covered the area of user resistance, primarily when it comes to health information systems [17; 14; 13; 10], but is largely silent on the context of information systems implemented within national patent offices. To our knowledge, this article is the first contribution addressing the sources of resistance to IS implementations within patent office organizations. This paper is aimed at identifying sources of user resistance that may occur when implementing an information system supporting the operations of a patent office.

The outline of this paper is as follows. First, we provide a literature review on topics central to this research as the theories addressing resistance to information systems. Following this, the research methodology is discussed. Then, the empirical setting is provided by assessing the resistance to the implementation of an information system at the Brazilian patent office. Subsequently, reflections are made regarding the lessons learnt from the case. Finally, our conclusions are put forward.

2 Literature Review

2.1 Patent Office

As pointed out by Pavitt [20], innovation is inherently uncertain, given the impossibility of predicting accurately the cost and performance of a new artifact, and the reaction of users to it. Hence, the logic behind the patent system assumes that firms invest in risky R&D activities in order to generate innovative new technologies. These firms can protect their new technologies by applying for a patent [2; 9]. In case the patent-holder intends to commercialize the invention in other countries, a patent application needs to be filed in the national patent office of each desired country [25].

In practice, patent office organizations are public bodies responsible for processing patent applications for a country [8]. In short, the simplified workflow of patent offices can be described in the following way. First, the patent office receives patent applications continuously. After a period of confidential deposit, the patent applications are classified and sent to patent examiners with adequate technical background. Then, the patent examiner assesses the invention and search for prior art to decide whether the invention is patentable [25].

2.2 Resistance to Information Systems

Our research provides a review and interpretation of resistance in the particular context of IS implementation. As a matter of fact, the expression "Resistance to Information Systems", as used in this article, includes all instances both of non-usage and of inadequate use of information systems by the potential users [17]. This resistance is also identified when individuals adopt behavior that may lead to the discontinuation or removal of the system [14; 12].

IS literature has examined the phenomenon of resistance primarily concerning health information systems [6; 10; 13]. For instance, Horan et al [10] demonstrated that medical professionals will not allow a system to become successful within a hospital if it is inadequate for their work practices. Similarly, Paré [19] conducted multiple case study to understand resistance to the implementation of clinical information systems within a US hospital. Nevertheless, the pioneering work of Markus [17] continues to be the sole benchmark in the treatment of collective behavior within the scope of the organization. Lapointe and Rivard [14], in turn, elaborated a theory that integrates the individual and collective levels of action.

Previous literature suggests several theories for understanding the cause of user resistance to IS implementations. According to Markus [17], there are three alternative vectors, derived from the general view of resistance. These three vectors comprise: System-Oriented Theory, People-Oriented Theory and Interaction Theory.

System-Oriented Theory.
Fundamentally, the system-oriented theory states that individuals or groups pose resistance to IS implementations due to factors related to the design of the system. As such, the system-oriented theory argues that resistance is derived from external factors related to the system's design [13]. Markus [17] cites the following as examples of system factors that incur resistance: lack of user-friendliness, technically deficient systems, and poor ergonomic design. According to the system-determined theory, when such factors are present, the system's intended users will resist its utilization.

People-Oriented Theory.
People-oriented theory suggests that people resist the new system because of factors internal to a person or group [11]. As such, this theory presupposes that people or groups resist information systems for factors of a personal nature [17]. Examples of this vector include, for instance: lack of training, fear of computers and the lack of perceived utility by the user in relation to the system.

Interaction Theory.
The interaction theory is certainly the most sophisticated of the three theories. That theory involves people factors as well as system factors. This explanation identifies neither the system nor the organizational setting as the cause of resistance, but their interaction. Essentially, resistance-generating conditions are mismatches between the patterns of interaction prescribed by a system and the patterns that already exist in the setting into which the system is introduced [17]. Thus, the resistance is explained as a product of the interaction of system design features with the intraorganizational distribution of power dimensions [13].

Markus [17] acknowledges the existence of various ramifications for this interaction vector. Consequently, she highlights two perspectives, namely the socio-technical variant and the political variant. The socio-technical variant focuses on the distribution of responsibilities for organizational tasks. This variant emphasizes that new information systems can give rise to a new division of labor and of functions and responsibilities that is different from that which existed prior to that time in the organization. In this way, IS implementations can be perceived as enablers of organizational change [12]. In the political variant, resistance can be explained as a product of the interaction between design attributes of the system and the intra-organizational distribution of power and status. In this variant, the systems are developed and implemented with the main objective of influencing the power between different organizational sub-units [12; 17].

2.3 Overview of Causes of Resistance to IS

Given the different aspects of the three theories on resistance to IS outlined above, it was possible to develop an overview of the theories. Therefore, in this study a decision was made to use the pioneering ideas of Markus (1983), since it incorporates the various dimensions relating to resistance to information systems. Consequently, Table 1 summarizes the three approaches to resistance to information systems.

Table 1. Causes of Resistance to Information Systems; Source: (Markus [17]; Joia [12]; Joia & Magalhães [13])

Causes of Resistance to IS		
System-Oriented Theory	**People-Oriented Theory**	**Interaction Theory**
Characteristics of the system	Factors inherent to people	Interaction System – Context of Use
Lack of flexibility	Lack of training	SOCIO-TECHNICAL VARIANT
Graphic interface/usability perceived as poor	Resistance to technology	Interaction of the system with the division of labor
Unnecessary complexity	Fear of computers	POLITICAL VARIANT
Poor ergonomic design	Inadequate technical project	Interaction of the system with the distribution of intra-organizational power

3 Research Method

This paper studies the resistance to implement an open-source information system at the Brazilian patent office. Here we use a case approach to explore resistance to the implementation of information systems from a qualitative perspective. We adopt a case study approach that examines a phenomenon in its natural setting, using multiple methods of data collection [5; 15]. According to Yin [26], case study is an adequate methodology to answer "how" and "why" questions. Moreover, Stake [23] argues that case study is not a choice of the research, but rather a choice of the research object.

There has been a growing interest in the use of qualitative techniques in the administrative sciences. A fundamental difference between case studies and quantitative methods is that the case study researcher may have less a priori knowledge of what the variables of interest will be and how they will be measured [1]. For quantitative data, there are clear conventions the researcher can use, such as the widely accepted rules of algebra through which the validity of mathematical deductions is known [15]. Given the lack of previous research on resistance to PMS implementation, the qualitative approach is the most adequate to provide a rich understanding of this new field.

In this study, data was collected through the triangulation of several methods, which included participant observation, in-depth interviews and document analysis. We carried out in-depth interviews with the key developer, several users of the PMS, as well as patent examiners from other patent offices, who also have experience using a PMS. Besides identifying the world view of the primary stakeholders, the interviews were intended to identify actors that supported and opposed the system. The interviews were held between September 2011 and January 2013. The interviewees were: SISCAP´s developer, Vice-President from INPI, Patent Examiners from INPI, as well as Patent Examiners from other patent offices: European Patent Office; Pakistan Patent office and Norwegian Patent office.

In essence, the data analysis process consisted of both triangulating data sources, as well as developing a code scheme. The code scheme contributed to group similar events into a similar heading. In order to enhance reliability, key informants were also requested to review the case study report. According to Yin [26], the corrections made through this process contribute to enhance the accuracy of the case study.

4 Case Study: Implementation of SISCAP

This case examines the development and implementation of an information system that supports the operations of the Brazilian national patent office. This system called 'Sistema de Cadastramento de Produção' (SISCAP) is an open-source information system designed and developed entirely by a Brazilian patent examiner who examines patent applications in the field of electronics. The initial idea for the system arose in 1998, short after the SISCAP´s developer joined INPI. Seeking to improve the efficiency of the patent examination process, SISCAP was designed based on his experience accumulated as a patent examiner. Given his previous experience with the

development of information systems, it was possible for him to visualize the benefits of automating some of INPI´s manual procedures and, hence, he found an opportunity to become an open-source pioneer at INPI.

Nevertheless, the start of SISCAP´s development only started in 2002, after the completion of a specialization program in web design at COPPE/Universidade Federal do Rio de Janeiro (UFRJ), which is widely know as a reputable technical institution in Brazil. Here it is also worthwhile to mention that the costs associated with his enrollment in this program were covered by INPI. According to the SISCAP´s developer, attending this specialization program enabled him to rapidly acquire programming skills on languages used for the development of web applications.

Fig. 1. SISCAP Interface

The initial SISCAP prototype was a simple tool developed in ASP within the Windowns operating system to support the work of senior patent examiners in providing training to junior patent examiners. This initial prototype was not an institutional project, but rather an individual initiative, which was developed by the SISCAP´s developer in his free time. The system was designed to enable senior examiners to upload electronic files containing patent examination reports elaborated by junior patent examiners. This first version was implemented at the desktop of the SISCAP´s developer, but the other patent examiner could access this early version remotely from their own computers. Over the years, new functions were constantly added to the system. Figure 1 displays the current SISCAP´s interface available to patent examiners. This initial page generated after logging into the system, provides access to several functions such as generating documents with data corresponding patent applications, see all uploaded reports, access patent applications available for examination, etc.

4.1 Facing Initial Resistance

As head of an INPI´s division, the SISCAP´s developer initially used the system to review the quality of the reports produced by junior patent examiners. In 2006, senior patent examiners fulfilling the role of tutors to junior patent examiners used SISCAP during the training period of junior patent examiners. However, once this training program was complete, the tutors immediately stopped using SISCAP. This means that the senior patent examiners started to do everything on paper again, even after experiencing the convenience associated with a tool that provided complete forms with data on the patent applications, generated management statistics and enabled the storage of all patent reports. In short, all tutors decided to start doing everything again only on paper simply because using SISCAP was not compulsory in 2006. As can be seen from a declaration of a patent examiner transcribed below:

"I had a concern regarding the control over the system and there was significant uncertainty regarding the use of data collected by SISCAP".

In order to extend the use of SISCAP within INPI, the SISCAP´s developer demonstrated this first version of the system to a couple (two or three) of other patent examiners of other divisions who also started working for INPI in 1998. This informal demonstration occurred in the first semester of 2006. Yet the reactions of this group of patent examiners was primarily negative, thereby frustrating the initial expectations of the SISCAP´s developer who hoped that the convenience generated by the automation of the process of filling in information in the patent report would convince the patent examiners to adopt the system. It turned out that SISCAP was heavily criticized by these patent examiners. According to the SISCAP´s developer, the following criticism was made by this group of patent examiners towards him:

"You are a patent examiner, so why are you trying to develop an information system to INPI? This is not your responsibility!"

"I don´t want to make it possible for other people to see my patent reports"

"Implementing this system is unethical.You are unethical"

A few weeks after demonstrating SISCAP to patent examiners of other divisions, the SISCAP´s developer was called to attend an individual meeting with INPI´s Director of Patents. The topic of the meeting was an anonymous complaint that the SISCAP´s developer was creating an unauthorized parallel system for registering patent reports. Despite the verbal warning, this meeting did not result in any formal punishment, as the motivation behind the system was clarified.

Despite this frustrated attempt to promote a voluntary adoption of the system, the SISCAP´s developer continued the development of the system by himself. However, he decided to stop promoting its adoption within the organization and to only use it within his division. The first major design change, involved the migration of the

application from the proprietary ASP platform from Microsoft to the open source PHP/MySQL platform. This design decision was motivated by the need to improve performance of the system and the awareness that a large-scale service like Wikipedia was entirely developed upon the open-source PHP/MySQL platform.

4.2 SISCAP's Adoption

As a consequence of this resistance, for more than two years, the adoption of SISCAP remained limited to the division of the SISCAP´s developer. The rate of adoption started to speed up significantly after the application obtained political support from a higher-level management of INPI. Basically, strong political support was provided by a patent examiner occupying a management position at the presidency of INPI. As such, the heads of other divisions relating to chemical and biological technologies also decided to adopt SISCAP, which resulted in more than half of the Brazilian patent examiners using the system in the beginning of 2009.

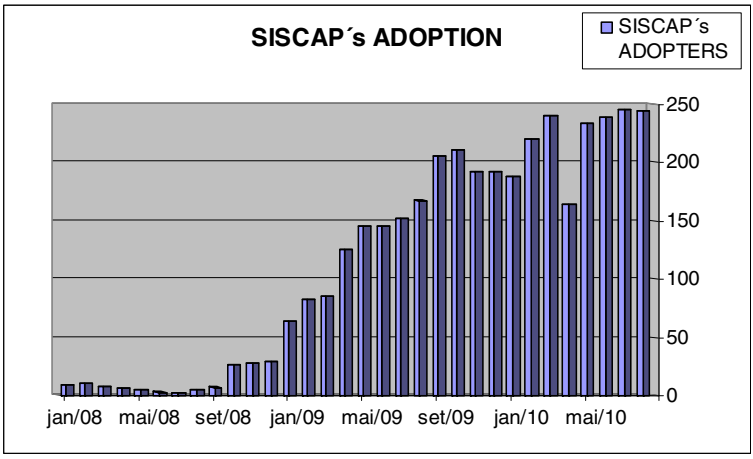

Fig. 2. SISCAP´s adoption over time. (Source: SISCAP Stat).

Despite the initial resistance posed by some patent examiners, the adoption of SISCAP became obligatory in September 2009 with the publication of an internal memorandum that turned SISCAP into the official system for uploading patent reports of all patent examiners at INPI. This memorandum forced the last divisions to adopt SISCAP immediately. Given the experience obtained with the promotion of SISCAP, it was possible to determine that without political support from INPI´s management, it would be impossible to convince all patent examiners to adopt the system. Here a top-down approach turned out to be the most effective implementation strategy. Figure 2 displays a graph representing SISCAP´s adoption in terms of the number of patent examiners using the system.

4.3 Expanding the Technological Infrastructure

Since SISCAP became an official system, the INPI administration decided to gradually expand the technological infrastructure for the system. However, this configuration of SISCAP implemented in a single desktop has imposed performance limitations that made it impossible to scale up the system. In this way, towards the end of 2009, the system was migrated from the machine of the SISCAP´s developer, which runs Windows, to IBM blades running Linux. Beyond the computational resources, another patent examiner and a programmer started working on SISCAP in order to integrate it with the other systems at INPI. This integration effort, which is called the `e-patentes` project, was awarded a national-government prize in 2012.

5 Case Discussion

By examining the implementation of SISCAP at INPI, it was possible to identify a set of patterns characterizing resistance to the implementation of a PMS. In order to clearly describe the source of resistance, each element of the three theories on resistance to IS are examined and an overview of the sources of resistance is provided in table 2.

Table 2. Identified sources of resistance associated with the implementation of SISCAP

Causes of Resistance to IS	
System-Oriented Theory	**Observations**
Characteristics of the system	LOW RELEVANCE: The interviews did not reveal problems with the specific characteristics of SISCAP.
Lack of flexibility	LOW RELEVANCE: The need for more flexibility was not identified.
Graphic interface/usability perceived as poor	LOW RELEVANCE: There were no complaints from patent examiners regarding the design of the system. It was not an important factor.
Unnecessary complexity	LOW RELEVANCE: The system was not perceived as unnecessarily complex.
Poor ergonomic design	LOW RELEVANCE: Design was not a barrier.
People-Oriented Theory	**Observations**
Factors inherent to people	HIGH RELEVANCE: Patent examiners are highly specialized technical professionals and their decisions on patentability of inventions have significant financial implications for firms.
Lack of training	LOW RELEVANCE: SISCAP is considered relatively simple to use.
Resistance to technology	LOW RELEVANCE: Given their educational background, patent examiners are likely to have much experience with complex technologies.

Table 2. (*Continued.*)

Fear of computers	LOW RELEVANCE: As opposed to medical staff, most patent examiners seem to feel comfortable with computers.
Inadequate technical project	LOW RELEVANCE: The technical project was not carefully assessed by patent examiners who offered resistance to SISCAP´s implementation. Apparently, any PMS project would generate resistance.
Interaction Theory	**Observations**
Interaction System – Context of Use	HIGH RELEVANCE: The patent office has a very particular institutional context, as it gathers a high level of expertise in several technical areas.
SOCIO-TECHNICAL VARIANT	HIGH RELEVANCE: Patent reports may have huge financial implications for firms. As such, many patent examiners may perceive access to their reports as a new form of control.
Interaction of the system with the division of labor	
POLITICAL VARIANT	HIGH RELEVANCE: Alignment of the system with the political environment of the organization was critical in order to obtain support from high-level management. User resistance was circumvented by making the use of the system compulsory.
Interaction of the system with the distribution of intra-organizational power	

This overview identifies neither the system-oriented theory nor the people-oriented theory as the main source of resistance in the SISCAP case. Here the interaction theory seems to have the strongest explanatory power. As argued by Markus (1983), users are inclined to use a system if they think the system increases their power, but users are inclined to resist using a new system if their power is threatened. Obviously, in the SISCAP case, user resistance was closely related to the perception that the implementation of the system would be a threat to the power of patent examiners.

6 Conclusion

We have identified different sources of resistance to the implementation of SISCAP explaining why widespread adoption of the system could only be accomplished by turning the system compulsory. In fact, when the introduction of an information system, such as SICAP, specifies a distribution of power, which represents a perceived loss to certain patent examiners, this group is likely to resist the system. Three major points emerge from the above discussion.

First, the social context surrounding a PMS and the possible organizational conflicts existing in the organization have a strong impact on implementation of the system and can even determine whether it will succeed or fail [17; 14]. Therefore, it is

important to analyze the context in which the system will be implemented in order to understand clearly how the system will be perceived by patent examiners.

Second, the uncertainties arising from the implementation of SISCAP resulted in passive resistance in the form of a delayed use of the system. Accordingly, full adoption of the system was only accomplished by making the use of the system compulsory to all Brazilian patent examiners.

Third, the fact that SISCAP resulted from an individual initiative of a patent examiner generated resistance motivated by a misinterpretation on the motivation behind the system. Consequently, seeking high-level management support of a PMS seems to be the most appropriate implementation strategy.

Finally, our analysis provides a blueprint to guide future research and facilitate knowledge accumulation concerning the sources of resistance to information systems supporting the operations of patent offices.

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Modular Architecture for Adaptable Signature-Creation Tools

Requirements, Architecture, Implementation and Usability

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Abstract. Electronic signatures play an important role in e-Business and e-Government applications. In particular, electronic signatures fulfilling certain security requirements are legally equivalent to handwritten signatures. Nevertheless, existing signature-creation tools have crucial drawbacks with regard to usability and applicability. To solve these problems, we define appropriate requirements for signature-creation tools to be used in e-Government processes. Taking care of these requirements we propose a modular architecture for adaptable signature-creation tools. Following a user-centered design process we present a concrete implementation of the architecture based upon the Austrian Citizen Card. This implementation has been used to prove the applicability of the architecture in real life. Our tool has been successfully tested and has been assessed as usable and intuitive. It has already been officially released and is widely used in productive environments.

Keywords: Electronic Signatures, Qualified Signature, Signature-Creation, Usability, User-Centered Design.

1 Introduction

Electronic services have gained importance in the last years. Compared to conventional services they allow cost reduction and more efficient procedures. An increasing number of electronic services are being provided in all e-Business domains. For security and privacy sensitive services such as e-Government, electronic signatures guarantee authenticity and integrity.

Especially in the e-Government sector the legal aspects of electronic signatures play a major role. In 1999, the European Commission published the EU Signature Directive [1]. The Directive had to be implemented by national laws and defines equivalence between a handwritten signature and an electronic signature fulfilling certain security requirements (‘qualified signature’).

The European Commission Decision 2011/130/EU [2] defines standard signature formats for advanced electronic signatures. In addition, the Digital Agenda for Europe

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 274–285, 2013.

[4] and the e-Government action plan [5] aims to create a single digital market for Europe. Obviously, these activities demand for appropriate signature tools.

Currently a variety of signature-creation tools and applications are on the market. Unfortunately most of them lack usability or applicability. Either they do not support 'qualified signatures' or all standard formats, or they are available as online tools only. Nevertheless, many citizens and companies want or have to use an offline tool due to security and privacy obligations. Therefore there is a need for an offline tool creating 'qualified signatures'. In addition, current signature-creation tools do not allow to freely position a visual representation of the signature in the document. To fill this gap our paper presents a modular and adaptable architecture for signature-creation tools. In addition – to validate the applicability of our proposed architecture – we present a concrete and user-oriented implementation of the architecture based on the Austrian Citizen Card. The main reasons for choosing the Austrian Citizen Card as a basis are: (a) electronic signatures are widely used in Austria and thus we expect a high volume of users and (b) the Austrian official signature as introduced by Leitold et al. [12] defines a visual representation of the signature and therefore an adequate positioning of this representation is needed.

The remainder of this paper is structured as follows: Section 2 gives an overview of the legal and technical framework our solution is based on. In Section 3 we elaborate on requirements for adaptable and secure signature-creation tools and applications. Section 4 presents our modular architecture for signature-creation tools. In addition, details about the implementation of this architecture are given. Section 5 describes the user-centered design method we followed to achieve a high grade of usability of our solution. Finally, we draw conclusions and discuss future work.

2 Legal and Technical Framework

2.1 Legal Regulations

The Digital Agenda for Europe aims to "*develop a digital single market in order to generate smart, sustainable and inclusive growth in Europe*" [6]. To achieve this objective, (cross-border) electronic services are one of the key enabling factors. This has been refined in the e-Government action plan for the period 2011-2105 [5]. The action plan objective is to create a new generation of administrative services. However, electronic signatures are necessary to provide secure and reliable electronic services.

Electronic signatures have been discerned as a key factor for successful e-Government early on. Already in 1999, the European Commission published the Directive on a Community framework for electronic signatures[1] [1]. The Directive defines a basis for legal recognition of electronic signatures. It includes a definition of different characteristics of electronic signatures and defines their legal effect. In

[1] Better known as the EU Signature Directive.

particular, it defines that an advanced electronic signature must meet the following requirements:

"(a) it is uniquely linked to the signatory;
(b) it is capable of identifying the signatory;
(c) it is created using means that the signatory can maintain under his sole control; and
(d) it is linked to the data to which it relates in such a manner that any subsequent change of the data is detectable;" [1]

In addition, Article 5 of the Directive defines that *"advanced electronic signatures which are based on a qualified certificate and which are created by a secure-signature-creation device […] satisfy the legal requirements of a signature in relation to data in electronic form in the same manner as a handwritten signature satisfies those requirements in relation to paper-based data"*[2] [1]. This means that such 'qualified signatures'[3] are legally equivalent to handwritten signatures which is a common precondition for e-Government processes.

2.2 Technical Background

From a technical perspective we concentrate on the Austrian Citizen Card concept [10] as the implementation of our solution is based on it. This concept defines the Citizen Card as a technology neutral instrument that enables to create and verify electronic signatures according to the Austrian e-Government act [8] and e-Signature law [9][4]. That means different forms of Citizen Card tokens can exist. Currently, smart card-based as well as mobile phone-based Citizen Card implementations are available.

To integrate these various tokens a middleware is used. This *Citizen Card Software (CCS)* implements a high level interface[5] that provides diverse functionality such as the creation and verification of electronic signatures. Different types of this citizen card software exist:

- *Online-based CCS*: This smart card-based CCS runs on the server side and provides the desired functionality via a Java applet to the user. Actually, the only available online based CCS is MOCCA Online[6].

[2] The terms 'qualified certificate' and 'secure signature creation' and their requirements are defined in Article 2 of the Signature Directive.
[3] The term 'qualified signature' is not explicitly defined in the Signature Directive. However, this term is usually used in literature.
[4] The Citizen Card offers additional functionality, such as identification of citizens and data encryption. However, these are not needed for our use cases.
[5] The so-called 'Security Layer '
[6] MOCCA Online: `http://joinup.ec.europa.eu/software/mocca/description`

- *Local/Client-based CCS*: This CCS is also smart card-based and has to be installed locally on the client machine. Here, different implementation exists, e.g. MOCCA Local[7], a.sign Client[8] or TrustDesk[9].
- *Mobile phone signature-based CCS*: This CCS which uses a simple mobile phone is available at https://www.handy-signatur.at/. It is based upon a two factor authentication using a password and a TAN (sent via SMS to the mobile phone).

Concerning signature formats, the European Commission, in their Decision 2011/130/EU [2] from 2011, published a set of standard signature formats which must be processable by all competent authorities acting under the EU Services Directive [3]. Namely these formats are the advanced electronic signatures CAdES, XAdES, and PAdES. However, Austria has rolled out a proprietary PDF-based signature format (PDF-AS) several years ago [11,12]. This format is going to be replaced by PAdES, but currently it is still widely used. Therefore, we have chosen this signature format to implement in our signature tool (see Section 4 for details).

3 Requirements

The secure and reliable signature-creation of electronic documents plays a central role in most e-government solutions. Signature-creation tools must meet several requirements to satisfy legal regulations as well as the needs of all user groups. On the one hand, the signature-creation tools must fulfill the requirements for the public sector and organizations. On the other hand, the tools should be intuitive and convenient to use for every single citizen. Considering the needs of all user groups, reliability, usability, adaptability, and modularity are identified as core requirements for signature-creation tools. These requirements are refined as follows:

- **Reliability and Privacy**

Signature-creation tools typically process sensitive personal and business data. Misuse of this data may seriously compromise citizens and businesses. Hence, reliability and trustworthiness of this data is an essential requirement. In addition, the public administration needs certainty about the identity of the citizens or businesses. The same applies for the identity of the public administration. So, reliability of the affected parties must be achieved. Finally, citizens, businesses, and public administration need assurance that the data processing satisfies legal and privacy regulations.

- **Usability**

Usability is another major requirement for signature-creation tools. Signature-creation tools are using cryptographic techniques like public key infrastructure (PKI) or secure signature creation devices (SSCD) such as smart cards as required for generating 'qualified signatures'. Most likely, users do not have the necessary background

[7] MOCCA Local: `http://joinup.ec.europa.eu/software/mocca/description`
[8] `http://www.a-trust.at/`
[9] `http://www.itsolution.at/digitale-signatur-produkte/desktop/trustDesk.html`

knowledge about complex cryptographic concepts and legal regulations. Plenty of security-sensitive tools are simply too complex for most users. In general, users are not interested in technical details. To improve the usability of signature-creation tools, this complexity must be hidden from the user. Instead, the focus has to be on presenting important information to users. To ensure usability, identified user groups must be involved in the design and development process of such tools.

- **Comprehensive Format Support**

In the next years a significant increase of electronic signature enabled cross-border services is expected (see Digital Agenda for Europe [6] or EU Services Directive [3] for instance). Although the European Commission Decision 2011/130/EU [2] has defined standard signature formats, various other (partly proprietary and nation-wide) formats are still in use. This implies that the support of these signature formats is still required. Hence, the ability to enhance signature-creation tools to support additional signature formats is crucial. Obviously these enhancements should be possible with minimal effort.

- **Cross-Platform Applicability**

Usually, e-Government applications and services must not be limited to specific hardware or software components. Services provided by public authorities must be accessible for all citizens without any restrictions and irrespective of the used environment. Thus, the availability of cross-platform applications is an essential requirement for signature-creation tools.

- **Offline Availability**

In many cases electronic documents contain personal or sensitive data. Therefore document owners are interested in keeping this data undisclosed, either due to privacy regulations, business policies or because of other privacy reasons. Server-based approaches are problematic in this context, because users do not want to upload sensible data to a remote server. Therefore, signature creation tools should offer a client-based implementation for creating electronic signatures.

4 Architectural Design

In this section we elaborate on a modular architecture and design for signature-creation tools satisfying the identified requirements. To verify the applicability of this architecture we have implemented a signature-creation tool for use cases of the Austrian e-Government. Due to the widespread usage of the Austrian signature format PDF-AS we have given this format priority. The following subsections describe the proposed architecture and give details on the implementation.

4.1 Architecture

Fig. 1 illustrates our proposal for a modular and adaptable architecture for signature-creation tools. The architecture supports various document formats, allows for the

creation of different signature formats and makes use of different signature-creation devices. This modular approach is achieved by defining a generic signature-creation process. Depending on the current state of the process, specific implementations of the various components are used to create a signature for the current document. All those generic components are adaptable and open for further implementations and extensions to support new document types, signature formats, or signature-creation devices. Subsequently we describe our architecture and the involved components or modules (see Fig. 1):

- **Input**

The input module reads a given document and determines the MIME type[10] for further processing. It generates a document dependent state which is used during the whole signature-creation process. This module can support local files, network files or even streams, and presents this input data in a common form to the other modules. When the input module has finished its task, the state is handed over to the viewer module.

- **Viewer**

The viewer module enables presentation of the document to be signed. It uses document-specific implementations for the presentation. These may be e.g. PDF renderer, MS-Word renderer, XML renderer, HTML renderer, and so on.
Depending on the used signature format, a visual signature representation and a customized signature positioning can be supported. In this case the viewer module provides a Positioning component which presents an overlay to allow the user to position the visual signature representation. The chosen position is then stored in the state of the signature process.

- **Signer**

The signer module is responsible for the delegation between the signature component adapter and the signature creation device component. Depending on the state, the signer component chooses an appropriate signature component for the given document, or uses a preconfigured component for the given document class. It provides the chosen signature component adapter with a specific instance of a matching signature creation device, which again is either chosen on the fly or may be preconfigured.

- **Signature Component Adapter**

This adapter is used to provide a common interface to e.g. a signature library. The signature format implementation generates the signature data and uses an abstract signature-creation device to obtain a valid signature for this signature data. Given the signature and the signer certificate the concrete signature component is able to create a valid digitally signed document. This signed document is again stored in the process state.

[10] The MIME type defines the document format.

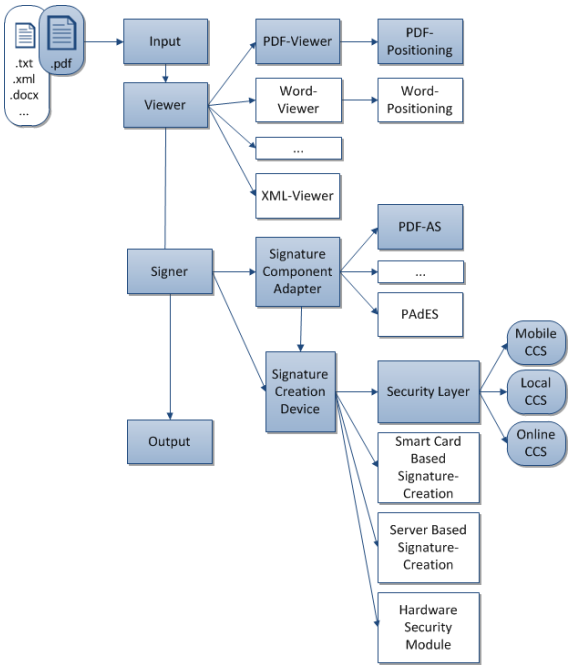

Fig. 1. Modular and adaptable architecture for signature-creation tools

- **Signature Creation Device**

The signature creation device is an abstraction layer for signature-creation. It translates the given requests to implementation specific commands to create a signature. The specific implementations can support any kind of signature-creation device, e.g. smart card [11] -based or server-based signature-creation devices, or hardware security modules. In addition, it supports Austrian citizen card software, which is integrated via the standardized interface 'Security Layer'. Thus, all citizen card software implementations (online, local and mobile phone-based) are supported.

- **Output**

When a signed document is available within the process state, the output module allows the user to save the signed document, to open it with the default application or to view it again with the appropriate viewer module.

4.2 Implementation

To put the proposed architecture into practice and to verify its applicability, a well-defined subset of this architecture has been implemented: signing of PDF documents with the Austrian PDF-based signature format PDF-AS was chosen. Our implementation is based on Java, thus achieving platform independence. Fig. 1

[11] Using the PC/SC (Personal Computer/Smart Card) interface.

highlights the modules that have been implemented in our application. Namely these main modules are:

- PDF-Viewer module including positioning of the visual signature representation
- Signature Component Adapter PDF-AS
- Signature-Creation Devices based on the Austrian Citizen Card via 'Security Layer'

The process flow starts with the input component, which allows the user to select a PDF document to sign, either via drag and drop, or via an operating system file selection dialog. The viewer displays the PDF document and enables the user to position the visual signature representation. This step can be skipped if the user configured the application for automatic signature positioning. The signer component receives the document to be signed and the desired position of the signature block. With this information, a signature request for the citizen card software is built by the signature component. Here, the user chooses the concrete implementation of the signature creation software (online, local or mobile phone-based implementation). Subsequently, the signature request is signed using the selected citizen card software. Finally, this signature is incorporated into the PDF document by the PDF-AS signature component and the thus signed document is sent to the output component. Within the output component the user is able to save and open the signed PDF document.

The user interface is based on this linear process flow and guides the user through the necessary steps. Fig. 4 shows a screenshot of this interface. Depending on the configuration of the tool, certain process steps can be shortened or entirely skipped for daily use by advanced users. For instance, the document to be signed can be selected by dropping it on the program icon, the signature block can be positioned automatically, the citizen card software can be preselected, or the output filename or folder can be set in advance.

Our tool called *PDF-Over* has been officially launched in Austria[12] and is already widely used[13]. As we followed a user-centered design method for the implementation, the tool has been assessed as easily understandable and usable as well as intuitive. The following section gives detailed insights into this design methodology as applied to PDF-Over.

5 User-Centered Design Method

To fulfill the usability requirements of signature-creation tools discerned above, we followed the user-centered design (UCD) principles [14] in order to implement a security-sensitive application that is effective and usable in practice. UCD is a design methodology that at each stage of the design process focuses on user's needs, goals,

[12] PDF-Over, Version 4.0.0, 15.1.2013, `http://www.buergerkarte.at/pdf-signatur.de.php`

[13] Since the official launch about 2.000 users per month are gained.

preferences, and limitations. It is an iterative design process that requires continuous user feedback and tests. As shown in Fig. 2 the methodology consists of four design stages: analysis, design, implementation and validation. The method enables a complete remodel and rethinking of the design by early testing of conceptual models and design ideas. For the development of PDF-Over we have defined to repeat the entire design process three times[14] before launching an official release. The different stages in the creation of PDF-Over were:

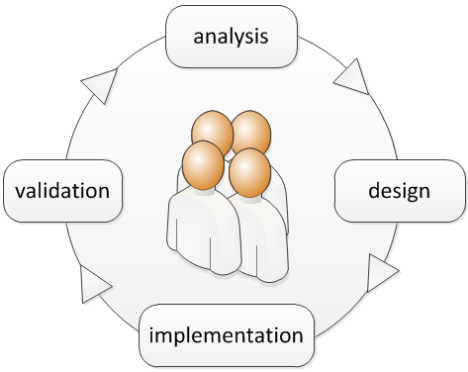

Fig. 2. Four design phases of User-Centered Design Process

- **Analysis**

At the beginning of the process we identified the end-users of PDF-Over. It turned out that the user groups of the signature-creation tool are citizens and authorities. In both groups users can again be divided into standard users and advanced users. After identifying those user groups we posed the question what each user group's main tasks and goals are and what functions are needed to accomplish those. The use case for citizens as standard users is to electronically sign a PDF document. They expect a simple und useable interface without any complexity. The authorities as standard users are interested in applying official signatures. To fulfill the Austrian official signature as introduced by Leitold et al. [12] certain criteria must be met, such as the placement of the visual signature representation. Additionally, advanced users need the possibility to e.g. pre-selected citizen card software, or enable automatic positioning of the visual signature representation. We also analyzed user's need of previous knowledge. In our case the end-user must know what the Austrian Citizen Card is and how to use it.

- **Design**

The second step in the iteration process is the design process. First, paper-based prototypes (see Fig. 3) and the initial architectural design were created. The focus on

[14] This is a common approach for most developments as indicated in `http://www.nngroup.com/articles/iterative-design/`

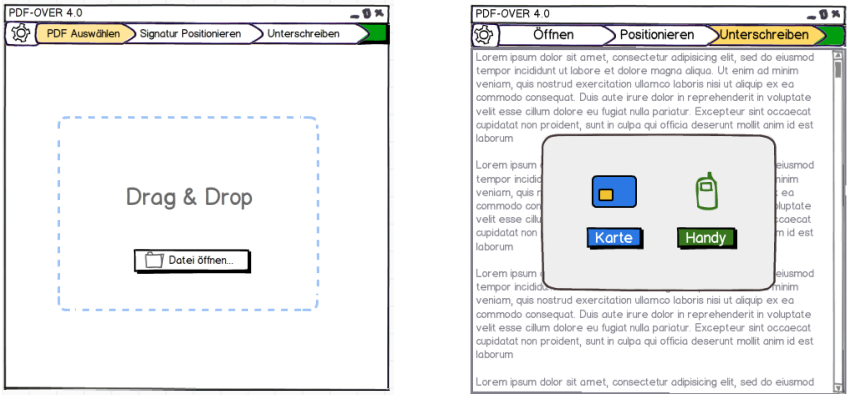

Fig. 3. Design prototypes

the end-users is very important in the early phase of the design. In order to get feedback from the users before writing code or beginning with the development, we performed usability tests with paper mockups.

- **Implementation**

In the implementation stage the detailed design and specifications were implemented and first source code was written. This stage builds upon the results of all prior stages. End-users were not directly involved during the implementation. Fig. 4 illustrates a first implementation of the tool, showing the positioning of the visual signature representation.

- **Validation**

After the implementation phase two approved usability methods have been applied to evaluate PDF-Over. First of all, an expert review was conducted. Here, an evaluator used the tool and assessed its usability against a set of usability principles, the so-called heuristics[15]. The heuristic evaluation provided quick and inexpensive feedback to the design. In the following implementation iteration the results from the heuristic evaluation were implemented.

In the last iteration, we performed a thinking-aloud test with five representative end-users. As indicated by Nielsen [13], five test users are sufficient to find almost all usability problems one would find using many more test participants. Test users have been asked to do representative tasks, while observers, including the developers, watched the test and took notes. The obtained results were analyzed and implemented in the last iteration. With the conducted usability analysis we improved the acceptability and usability of PDF-Over.

[15] http://www.nngroup.com/articles/ten-usability-heuristics/

Fig. 4. PDF-Over free positioning of the visual signature representation

6 Conclusions

Signature-creation is essential for many e-Government processes. Especially the creation of 'qualified signatures' is of high importance. In this paper we have presented a modular architecture for adaptable signature-creation tools. To prove the practical applicability and flexibility, we have given a concrete implementation of this architecture. To achieve a high impact our solution is based on the Austrian Citizen Card concept. We have followed a user-centered design to achieve a high usability of our tool. This tool has been successfully tested and is ready to accept current and upcoming challenges. The tool has already been officially launched in Austria and is licensed under the European Public Licence EUPL [7]. The current number of downloads amounts to about 2000 per month which confirms the high acceptance and usability of our solution.

Currently, we are integrating additional signature formats. Based upon the European Commission Decision 2011/130/EU we are implementing a PAdES signature component adapter to support PDF advanced electronic signatures. In addition, we are working on the support of batch signatures to allow signing of several documents in one step.

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Organizational Resistance to E-Invoicing – Results from an Empirical Investigation among SMEs

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Abstract. In order to improve the governmental efficiency, effectiveness and transparency, an important part of e-government is the digitalization of documents and the processing of these documents through electronic channels. Such a critical document in business process chains is the invoice, which is why the European Commission strives to increase the adoption and diffusion of electronic invoicing (e-invoicing) among public and private sector organizations. However, the adoption rate among businesses is still low and especially very small firms resist using e-invoicing.

By collecting quantitative and qualitative survey data of 416 German companies resisting the usage of e-invoicing, we confirm and explore factors affecting the resistant behavior towards the electronic exchange of invoices and elaborate on differences in those factors with organizational size. In particular among micro firms, the lack of knowledge regarding the theme and procedure of e-invoicing represents the relatively most important influencing factor, while comparatively larger firms also expect huge change management efforts.

Keywords: electronic invoicing, e-invoicing, resistant factors, resistance, SME.

1 Introduction

Electronic government (e-government) is the public sector's use of information technology (IT) to support government operations, engage citizens, and provide government services [33]. Although the term e-government has experienced different definitions and has been linked with multiple goals [21], e-government mainly aims at improving the governmental efficiency, effectiveness, transparency, and responsibility [36]. An important part of e-government to achieve these main goals – in particular related to the improvement of process performance at the government-to-business (G2B) and government-to-government (G2G) level – is the digitalization of documents and the processing of these documents through electronic channels.

A critical document in business process chains is the invoice. Especially within public sectors in Europe the invoicing process is regarded to be one of the processes with the highest potential for improvements resulting in productivity enhancements [8, 13], which is why electronic invoicing (e-invoicing) represents one of the main goals of the Digital Agenda initiative of the European Commission [9]. By switching from the paper-based to the electronic invoicing process, institutions of the public sector expect

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 286–297, 2013.

to achieve cuts in administrative costs, improve the performance of workflows, enhance the process transparency and traceability [1] and guarantee ecological sustainability [27, 28, 35]. According to the European Associations of Corporate Treasurers 243 billion EUR savings could be achieved across Europe by automating organizations and optimizing supply chains through e-invoicing solutions [11].

However, to realize the full potential of e-invoicing it is crucial that all business partners of both the public and the private sector adopt and use the electronic exchange of invoices. But despite the many advantages, the adoption rate of e-invoicing among organizations is still very low [1]. Especially small and medium-sized enterprises (SMEs), given their relative importance for the European economy as a whole [12] as well as their huge share of the public sector suppliers and customers in particular, still resist to use e-invoicing [7].

Likewise, although existing scientific literature on e-invoicing is chiefly concentrated on the identification of success factors and driving forces fostering the adoption and diffusion of the innovation e-invoicing [3, 16, 26, 38], investigations addressing reasons and forces for the non-adoption of e-invoicing are still scarce. In particular, there is a lack of research explaining the resistant behavior of organizations towards e-invoicing, although information systems (IS) scholar agrees that research on user resistance to technology is as important as on technology acceptance [5, 18].

Therefore, the objective of this paper is to empirically analyze factors affecting the resistance to the electronic exchange of invoicing data in order to improve an explicit understanding of the low levels of e-invoicing use at the organizational level. We concentrate our study on SMEs as the most important business partners of governmental institutions by working out similarities and differences in the identified influencing factors of e-invoicing resistance between companies of micro, i.e. with less than ten employees, versus small, medium and large sizes, i.e. with ten or more employees. Using quantitative and qualitative survey data of 416 SMEs resisting the usage of e-invoicing, we particularly address the following research questions:

RQ1: Which factors influence the resistance to e-invoicing among SMEs?
RQ2: Do the reasons of resistance differentiate with organizational size?

To answer both questions, the remainder of the paper is structured as follows: In the next section, we provide an overview of related research in the field of e-invoicing adoption to derive eight factors inhibiting the usage of e-invoicing. Section 3 then describes the applied research method. Afterwards the findings of our empirical investigation are presented and discussed. Section 6 concludes the study by providing limitations and suggesting paths for further research.

2 Related Work and Theoretical Background

In this section, we first present prior scientific literature in the field of e-invoicing with special focus on the research stream of IT adoption and user resistance to delimit

and sharpen our own approach. Based on this, we then derive eight factors influencing the resistance to use e-invoicing.

2.1 E-Invoicing Adoption and Resistance

The transfer of structured data in electronic form was already discussed in the 1970s due to the development of the EDI standard and especially EDIFACT (EDI for administration, commerce and transport), which also allowed for electronically transferring invoicing data between business partners. Since then, several different research streams on e-invoicing have emerged in IS research in order to investigate the opportunities and consequences of the electronic exchange of invoices across organizations of all sizes in both, the public and private sector from various perspectives and at different units of analysis. For example, some studies concentrate on the economic impact of electronic invoicing on the business performance within the organization [20], or across companies at the inter-organizational level [24, 25]. Moreover, several studies evaluate the carbon footprint of paper-based against electronic invoicing from an ecological perspective [27, 35].

By far the biggest stream, however, focuses on the identification of drivers and barriers of the electronic exchange of invoicing data to promote the adoption and diffusion of this IT innovation. Most studies within this stream conceptually or empirically investigate factors affecting the intention to adopt e-invoicing as well as the rate of e-invoicing adoption by applying well-known theories and models of the individual and organizational IT adoption and acceptance discipline, for example, the theory of planned behavior by Ajzen (1985) [2, 38], the diffusion of innovations theory by Rogers (1983) [26, 30], or by combining various models [3, 6, 32]. Besides, Au and Kauffman (2001) quantitatively assess the adoption behavior from the perspective of welfare economics taking into account the influence of network externalities [4]. By summarizing the scientific literature on e-invoicing and e-government adoption, Kreuzer et al. (2013) develop a unifying meta-model of influencing factors of e-invoicing adoption at the governmental level [17]. Whereas Juntumaa and Öörni (2011) analyze reasons behind partial IT adoption exemplified within the context of e-invoicing [16], merely Edelmann and Sintonen (2006) explicitly deal with the currently still low adoption rate of e-invoicing and empirically examine the reasons of e-invoicing non-adoption among Finnish SMEs based on real option theory [7].

Moreover, to the best of our knowledge, there is no study explicitly explaining the low levels of e-invoicing use with the action of withstanding the implementation of this innovative technology through the theoretical lens of IT resistance, although IS research agrees that there are different factors making clear the causes of technology acceptance versus its resistance [5, 18].

Within this research paper we analyze which factors influence the resistance to e-invoicing among SMEs in order to promote the development of an explicit understanding of the resistant behavior towards the electronic exchange of invoicing

data at the organizational level. In addition, we statistically compare the identified reasons of e-invoicing resistance between micro and larger businesses, because none of the existing e-invoicing adoption studies collecting data among SMEs, such as Edelmann and Sintonen (2006) or Sandberg et al. (2009), has focused on potential distinctions between inhibiting factors with organizational size [7, 32].

2.2 Factors Influencing User Resistance to E-Invoicing

In particular from those articles identified in the prior subsection encompassing the research stream of e-invoicing adoption, but also from further studies discussed in theory and practice we extracted eight potential factors that influence the resistance to e-invoicing. This section presents them in detail.

One of the most frequently mentioned factor driving the organizations' resistance to e-invoicing is the *lack of knowledge*, which is why we separated this variable into three partitions. First, the lack of IT knowledge in general comprising of the inexperience and limited skills of managers and employees regarding the usage of all kind of information technology [7]. Second, the lack of know-how with respect to the theme of e-invoicing as potential user organizations have so far not got enough information about possible technological solutions of e-invoicing resulting in difficulties with the provider selection [19, 31, 34], as well as the absence of know-how in implementing e-invoicing processes [34]. Third, in particular small organizations may not have tackled and gone into the theme of e-invoicing at all.

Furthermore, user organizations might expect a high *change management effort* when switching from paper-based to the electronic exchange of invoices, for instance, regarding the training of staff involved in the invoicing process or the necessary integration into already existing up- and downstream business processes [28]. This effort may absorb the financial advantages and hence, result in a perceived negative net present value of the e-invoicing implementation [14]. In addition, organizations do often not see e-invoicing as an integrated part of the whole e-procurement process and hence, do not take into consideration the overall financial gains that could be realized with the digitalization [22]. Consequently, firms will resist using e-invoicing.

The fifth factor we could identify refers to *legal uncertainties* [23]. Diverse interpretations and differences in national and European legislation and regulatory requirements regarding, for example, commercial and tax law, but also the lack of common international standards (e.g., XML) for layout and data elements will foster users resisting e-invoicing [1, 19, 31]. In particular, medium-sized international organizations with cross-border activities might be scared off the current legal inequalities and therefore, drop e-invoicing adoption considerations [22]. Besides of legal issues, *concerns with respect to security*, in particular, regarding the authenticity and integrity of invoices might inhibit potential companies using e-invoicing [34].

Finally, the last two factors that might impact the resistant behavior of organizations are based on potential *reservations of internal and external stakeholders* about e-invoicing. On the one hand, the absence of top management support and consequently, no encouragement and pressure with respect to the

implementation of e-invoicing within the company, but also negative attitudes and social influences of employees and colleagues within and across departments might inhibit the adoption and diffusion of e-invoicing [26]. On the other hand, even if internal board and staff members agree to implement a new electronic invoicing solution, there might still be the problem that external supply-chain partners and customers do not want to cooperate in using e-invoices [7, 34]. Therefore, potential demands for a change to the electronic payment process might act as a deterrent to suppliers and customers and expel them to another focal organization.

Next to the confirmation of those factors already discussed in IS theory and practice, our study also contributes to IS research by extending this list and exploring new as well as more fine-grained driving or inhibiting forces collected by the means of an open-ended question in our survey. The next section provides more details about our research method.

3 Methodology

In order to confirm and explore factors of resistance in the usage of electronic invoices, we conducted a survey focused on recipients of invoices. We distributed the survey together with actual paper-based invoices among customers of a manufacturing company striving for sending invoices electronically in future. In a period of four weeks approximately 5000 questionnaires were sent, of which 521 responses from accountants or financial managers could be gathered after eight weeks. To confirm our eight factors mentioned above and explore further relevant factors, we used a mixed method approach in our questionnaire [37], i.e., it contained eight questions about specific resistant determinants (respondents had to mark the appropriate factors with a cross) and offered an additional open-ended question for further responses concerning influencing factors. To separate between adopters and non-adopters of e-invoicing, we additionally asked for the current state of the invoicing process in each firm as well as their willingness to switch to the electronic exchange of invoices. In this work, we focus exclusively on the non-adopters, which resulted in a sample size of 416 participants.

4 Data Analysis

4.1 Demographics

All of our participants reside within Germany and are mainly SMEs and very few large corporations. The average company in this sample has six employees and receives around 250 invoices per year with only 2% of them as electronic invoices. To ensure the comparability of our analysis, we adopted the definition of SMEs suggested by the European Commission [10]. Table 1 displays the categorization according to firm size for both sample and subsamples.

Table 1. Sample profile

	Sample Size	Adopters	Non Adopters
Micro Firms (<10 Employees)	336	62	274
Small Firms (10 to 49 Employees)	156	36	120
Medium Firms (50 to 249 Employees)	20	4	16
Large Firms (>250 Employees)	9	3	6
Total	521	105	416

4.2 Quantitative Analysis

The relative importance of each resistance factor is displayed in Figure 1. The results reveal that the lack of preoccupation with the theme of e-invoicing has a huge impact on innovation resistance and is by far the most important factor in this sample scope. Change management effort is the second largest factor with 17%. 13% of the respondents are aware of e-invoicing, but show the lack of an in-depth know-how of this specific domain. Reservations of business partners, which merely account for 2% of the relative impact, seem less relevant, while reservations from executives have a stronger impact, namely 10%. Furthermore, legal and security concerns are very important hindering factors that have to be tackled. Interestingly, insufficient IT knowledge in general has a rather low impact on resistance with 6%.

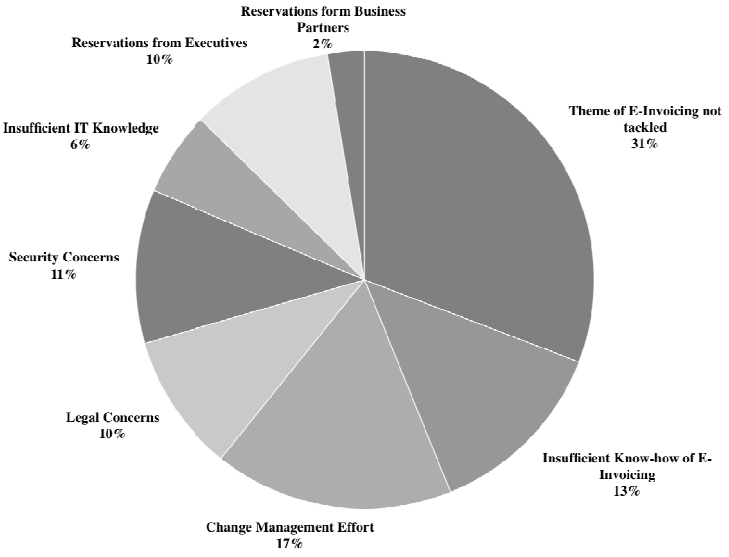

Fig. 1. Relative impact of resistant factors

Second, in order to answer RQ2, we categorized the data by company size in accordance to the European Commission [10]. We decided to focus on micro firms and their specific differences in comparison to larger firms as the structure and processes of companies with less than ten employees should be different to bigger ones and hence, also may require different automation. Half of the factors differ significantly between the two categories, which Table 2 shows. The analysis reveals some insightful differences between the two focus groups. Certainly, the factor 'theme of e-invoicing not tackled' remains the most relevant factor across both groups, but its relevance is slightly higher for micro firms. Nevertheless, the difference is significant, just as to insufficient know-how of e-invoicing. However now, the importance among both groups differs to a larger extent. The same is true for the factor insufficient IT knowledge. Both determinants have a higher relevance for micro firms and decrease in impact for larger firms. By contrast, change management effort has a larger relevance for larger firms than for micro firms.

Table 2. Comparison between impact factors across micro and larger firms

	Relative Impact	
Factors	**Micro Firms**	**Larger Firms**
Theme of e-invoicing not tackled*	33%	27%
Insufficient Know-how of e-invoicing*	17%	6%
Change Management Effort**	13%	25%
Legal Concerns	11%	8%
Security Concerns	9%	14%
Insufficient IT Knowledge*	7%	4%
Reservations from Executives	8%	14%
Reservations from Business Partners	2%	2%

*: p<0,05; **:p<0,01

4.3 Qualitative Analysis

In addition to the confirmatory nature of our quantitative analysis, which tested the relevance of resistant factors suggested by IS theory and research, we decided to combine our study with an exploratory approach by adding an open-ended question. The participants were encouraged to name further inhibiting factors. We got 91 responses, many of them very insightful contributions suggesting additional dimensions to our existing factors. To extract new forces, we codified the responses into reasonable categories. Table 3 shows the eight most mentioned factors, each with characteristic quotes from the participants.

Many respondents addressed the factor 'change management effort' that only includes the expenses for the implementation by mentioning higher operational costs due to two parallel invoicing processes, the lack of process readiness regarding the

existing workflow instead of costs as well as low IT readiness of the firm considering the current state of IT systems and infrastructure.

Furthermore, we identify the scope of invoices as a barrier. With a low volume of invoices, the benefits of e-invoicing might not compensate for the upfront investments as well as operational and maintenance costs. The same holds for network effects that might hamper the adoption because of an absence of potential exchange partners and therefore, again, not justifiable costs. Moreover, lack of perceived benefits addresses the insufficient propagation of potential advantages, whereas some of the micro firms and other SMEs even showed wrong assumptions about compliance with regulations concerning accountability and tax law. Finally, our qualitative analysis reveals error-proneness as a hindering factor. Apparently, there is a higher perceived possibility of potential errors with regard to the invoicing process among SMEs.

Table 3. Factors identified by open-ended question (translated into English)

Explored Factor	**Characteristic Responses**
Operational costs	"Additional costs for paper and printing, because paper invoices are still necessary." “Printing costs.” “Costs for printing the invoice.”
Process readiness	"Does not fit our processes." “We want paper invoices because they fit better to our operating procedure.” “We then have to print the invoices.”
IT readiness	"We do not operate an IT infrastructure." “Internet access too slow.” “Our software program is not adapted for electronic invoices.”
Network effects	“We would be the only firm that processes invoices electronically.” “We only take part if the other suppliers send their invoices per mail, too.”
Wrong assumptions	“I have to print the invoices for the tax accountant.” “Online invoices are not accepted by the tax office.” “Paper-based archiving is mandatory for 7 years.”
Scope of invoices	"We just get 4 invoices per month." “We are too small.” “Because of the firm size, it is easier when all invoices are received via the same channel: Mail.”
Lack of benefits	“Never change a running system…our invoicing process is ideal as it is.” “We see no benefits for our company.” “Perfect as it is.”
Error-proneness	“Invoices get lost in the e-mail inbox”. “Invoices may be directed to spam.” “Process may become confusing.”

5 Discussion

To the best of our knowledge, this is the first empirical study to investigate a set of resistant factors to e-invoicing from the different perspectives of micro versus small and medium-sized firms that resist the usage of e-invoicing. Based on a discussion of our results on the overall and subsample level, several implications for theory and practice arise, which will be outlined in this section.

The confirmatory part of our analysis shows, that on the overall level the lack of knowledge regarding the theme of e-invoicing and its underlying process deters SMEs most from using e-invoicing, which was followed by the expected high change management effort. This result is in line with existing studies previously conducted in practice [15, 28, 29] and suggests that managers of SMEs do apparently not know how to implement e-invoicing in their companies or which e-invoicing solution to select from which provider. That is why they may even be not able to assess the effort that emerges when switching from the paper-based to the electronic invoicing process and therefore, they may overestimate the investment necessary for the implementation. Consequently, it is crucial to better inform and teach board as well as staff members in SMEs and to clarify the potential benefits that can arise through electronically receiving invoices. These advantages might even be enhanced if the enlightenment helps to faster reach the critical mass and hence, to exploit potential network effects of e-invoicing. On the contrary, reservations of external stakeholders merely seem to play a minor role in explaining the resistant behavior of SMEs, which might be the case due to the limited perspective of SMEs regarding their external environment.

When we compare the subsamples of micro firms with the remaining ones, some noteworthy differences between specific influencing factors emerge. Both groups generally face the same barriers for the usage of e-invoicing, but apparently, they put different emphasis on these factors. Our findings show that micro firms, in particular, have not gone into the theme of e-invoicing so far, which might also be the reason why they perceive and assess potential investment costs and security concerns as less important compared to small firms. This implies for practice that providers for e-invoicing solutions should take those distinctions into consideration by addressing firms of different sizes differently, i.e., highlighting the general e-invoicing theme and potentials among micro firms whereas mainly soothing cost and security concerns of the remaining ones.

By taking a closer look at the additionally explored factors identified with the open-ended question the differences in firm size and consequently, in the invoicing volume are stressed even more. Micro firms receive less invoices compared to larger SMEs and hence, the financial advantages that could be realized with the electronic exchange of invoices shrink. Additionally, some firms explicitly mention the lack of perceived benefits of the e-invoicing process. So the question arises, if particularly micro firms can benefit from the electronic exchange of invoicing data at all or if they are even better off with the prevailing paper-based process?

To address this issue, besides of a mandatory enforcement of the e-invoicing adoption procedure, i.e., a legislation-based approach, both, government and e-invoicing provider should think of incentives to SMEs to artificially increase the advantages and hence, reduce their resistance to e-invoicing usage. A possible incentive might encompass, for example, a direct connection and forwarding to the tax accountant and with it, the extension of the electronic workflow with up- and downstream processes. Additional services including simple workflow solutions or archiving should also add value for micro firms. Future research may shed light on those issues.

To sum up, there are several factors influencing the resistant behavior towards the electronic exchange of invoices between business partners, but the relative importance of each factor varies with firm size. In particular, the reasons for resistance of micro firms are significantly different from larger SMEs.

6 Limitations and Further Research

As with any study, this research has several limitations. First, our approach concentrated on a specific set of resistant factors reflecting those discussed in prior theoretical and practical research studies. By adding an open-ended question, we could include additional reasons of resistance in our analysis. Nevertheless, future studies may reveal further factors and complete our list.

Second, even if we were able to ask a huge number of SMEs, our sample focuses on recipients of invoices only, which mainly belong to the manufacturing industry. Future research should therefore investigate resistant factors of e-invoicing senders and work out potential differences across industry sectors.

Third and finally, our survey was limited to binary questions regarding the respective single resistant factor. However, to fully investigate the influence of each factor on user resistance to e-invoicing, in future, an extended questionnaire allowing for answers using Likert scale and consequently, the application of regression analysis to statistically test the true effect size of each factor is appropriate.

Acknowledgements. This research is supported by the German Federal Ministry of Economics and Technology (BMWi). We gratefully acknowledge the financial support. Any opinions, findings, conclusions, or recommendations expressed in this paper are those of the authors and do not necessarily reflect the views of BMWi.

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The Influence of Social Context and Targeted Communication on e-Government Service Adoption

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Abstract. The electronic ID card (eID) was introduced in Germany in 2010. Besides the traditional way of authentication, it offers the possibility to activate a function for online authentication. However, more than two thirds of the Germans do not make use of this function. Despite the advantages that the eID offers, the lacking adoption is said to be traced back to lacking information and only few application cases. In our study, we propose online application as a use case for the eID in a university. In a quantitative survey with 1,632 students, we analyse the factors influencing a possible adoption of the eID by students. For this purpose, we extend the basic TAM by the variables perceived risk, social context, experiences, communication and demographics. Our analysis reveals that especially the social context and targeted communication influence the behavioural intention to use and can extremely shape the attitude towards using the service.

Keywords: electronic ID card, eID, e-Government, TAM.

1 Introduction

After years of debating, the German electronic ID card (eID) was introduced in 2010. [1] Besides being a piece of identification in the 'offline' world, it offers an electronic proof of identity and could also be used for signing documents electronically in the future. Although its launching was accompanied by much public interest, it could not meet the expectations of the government. Until recently, 17 million eID cards have been handed out to German citizens. However, only less than 30% of the respective citizens have activated the electronic identification function. [2] The number of online applications for the eID is currently limited to 42. [3] Qualified electronic certificates, which are a prerequisite for using the qualified electronic signature functions of the eID, were still in the test phase in December 2012. [4] There are several reasons for the reluctant start of the eID in Germany. On the one hand, the limited number of applications probably causes citizens to ignore possible advantages. On the other hand, security concerns contribute to the rather negative image of the eID. [5] Shortly after the release of the eID card in 2010, the Chaos Computer Club, one of the largest hacker organisations in the world, demonstrated that the reading devices that were distributed together with the card were insecure and could easily be cracked. [6]

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 298–309, 2013.

Thus, in order to overcome these barriers and to increase the adoption of the electronic use of the eID, it is crucial to offer services that are consumed by many citizens and that provide an actual benefit for the user. Furthermore, the government should implement a suitable strategy to counteract the reluctant intention to use the new eID card. The arising question is how such a strategy should look like. For answering this question, it is first of all necessary to understand the factors that influence the adoption of the eID.

In order to identify the influencing factors, we propose the application and enrolment process at a German university as a use case for the eID. Universities provide a suitable context for eID studies as many students are likely to possess the new eID card. Furthermore, applying and enrolling for a study is a process all students have to go through. We propose a research model to analyse the variables determining behavioural intention to use the electronic ID card. Our basic hypotheses are based on the Technology Acceptance Model. [7] As proposed by other studies, we extend our research model both by demographic variables, experience, social influence [8] as well as perceived risk [9], [10]. Furthermore, as suggested by previous research [11], we integrate (targeted) communication into our research model. Our resulting research questions are:

RQ1: Which factors influence the behavioural intention to use an eID application by students?

RQ2: Which influence does communication have on the adoption of eID services at universities?

The article is organised as follows. In the next section, we give a short overview of the eID in Germany. Furthermore, we derive our research model based on e-government respectively IT adoption literature. In Section 3, we describe our research methodology including the design and structure of the questionnaire, the process of data collection as well as of the analysis. This is followed by Section 4, where we present the results of our analysis, and Section 5, in which we discuss the impact of our findings. Section 6 summarises our results and shows both the limits of our study as well as the agenda for future research in this domain.

2 Related Work

The eID was introduced in Germany in November 2010 and since then Germany ranks among Belgium, Estonia, Finland, Italy, Portugal and Spain as one of the seven European countries that offer eIDs to their citizens. [12] The German eID provides an electronic proof of identity as well as an electronic signature function. [1] Although the eID is judged as rather secure, the resistance to use them is rather strong. [2]

The aim of our study is to understand both how eID services should be designed as well as how the accompanying communication should take place in order to increase the adoption of these services. Our research model is based on the Technology Acceptance Model (TAM) by [13]. TAM is an often applied model that describes the influence of different variables on IT adoption and that can be adapted easily for different application areas. [14], [15] For our purposes, we use the version of TAM from 1996, which includes the variable *perceived usefulness*, *perceived ease of use*,

behavioural intention and *actual system use*. [16] As the analysed IT application does not exist yet and as therefore the actual system use (see greyed out box in Fig. 1) cannot be measured, our dependent variable is behavioural intention.

We extend the basic TAM by the factors *perceived risk*, *social influence*, *communication at the university* as well as *experiences*. Our research model is shown in Fig. 1. Whereas the basic components of TAM are displayed in white rectangles, the added variables are displayed in light grey ones. The variables on the dark grey background are tested for their dependence on *demographic factors* (age, gender, computer skills, study programme). The assumed relations are shown by arrows.

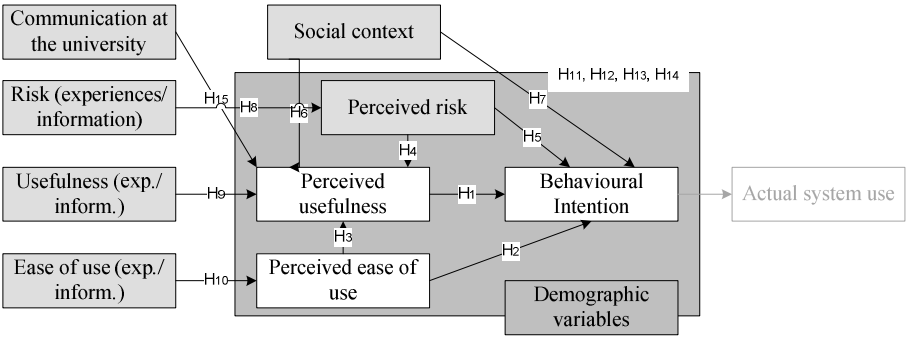

Fig. 1. Research model for the adoption of eID services at the university

Basic model: The basic model of TAM has been used in a variety of studies dealing with the adoption of IT since then. [16] TAM explains the actual use of a system as being influenced by the behavioural intention to use the system, which in turn is influenced by perceived usefulness as well as perceived ease of use. Furthermore, perceived ease of use also impacts perceived usefulness. Despite its popularity, TAM has been subject to a lot of criticism due to lacking objective antecedents as well as "black box" concepts. [17] However, as it is one of the most tested and most successful theories in IT adoption and also in e-government adoption (cf. e.g. [10], [18]), we base our basic hypotheses on the assumptions of TAM:

H_1: Perceived usefulness will positively influence behavioural intentions.
H_2: Perceived ease of use will positively influence behavioural intentions.
H_3: Perceived ease of use will positively influence perceived usefulness.

Perceived risk: In the research area of IT adoption and especially in e-government adoption, the notion of (perceived) risk plays an important role as many sensitive data is processed [11] as well as due to the impersonality of transactions on the internet [19]. In the context of e-government, perceived risk is understood as "the citizen's subjective expectation of suffering a loss in pursuit of a desired outcome". [20] Previous research on e-government acceptance suggests that perceived risk has a negative impact on perceived usefulness and behavioural intention. [9], [21], [22] In our survey, we especially focus on security concerns in terms of privacy and data security.

H_4: Perceived risk will negatively influence perceived usefulness.
H_5: Perceived risk will negatively influence behavioural intentions.

Social context: A further concept that has been analysed in IT adoption studies is social context. [23] identified a relation between social influence and behavioural intention. This hypothesis has been studied in different e-government specific studies, too. (cf. e.g. [24]) Further research suggests a correlation between social context and the attitudes of a system user [25], which is especially the case for social context and perceived usefulness. [26]

H_6: The social context will positively influence perceived usefulness.
H_7: The social context will positively influence behavioural intentions.

Experiences: Based on the Unified Theory of Acceptance and Use of Technology (UTAUT), an extension of TAM [8], we assume a correlation between the previous assessment of the eID based on experiences and information and perceived risk, perceived usefulness and perceived ease of use.

H_8: The previous assessment of risk based on experiences and information on the eID will positively influence perceived risk.
H_9: The previous assessment of perceived usefulness based on experiences and information on the eID will positively influence perceived usefulness.
H_{10}: The previous assessment of perceived ease of use based on experiences and information on the eID will positively influence perceived ease of use.

Demographics: Demographic factors have been identified as influencing factors in previous studies of IT acceptance. [27], [28] In our case, we analyse the impact of age, gender, field of study and computer skills on perceived risk, perceived usefulness, perceived ease of use and behavioural intention.

H_{11}: Age will influence perceived risk, perceived usefulness, perceived ease of use and behavioural intention.
H_{12}: Gender will influence perceived risk, perceived usefulness, perceived ease of use and behavioural intention.
H_{13}: The field of study will influence perceived risk, perceived usefulness, perceived ease of use and behavioural intention.
H_{14}: Computer skills will influence perceived risk, perceived usefulness, perceived ease of use and behavioural intention.

Communication: A further question is how communication influences the adoption of IT. Therefore, we analyse whether targeted communication content and channels can influence the attitude towards the eID. Communication can play a vital role in spreading information. [29] Furthermore, previous research suggests that lacking communication is one reason for reluctant e-government adoption in Germany. [11]

H_{15}: Targeted communication at university on the eID will influence perceived usefulness.

3 Methodology

In most studies, technology acceptance has been researched using surveys. [8], [9] As we propose a quantitative model to understand the influencing factors of the adoption of the eID card, our instrument was a standardised online questionnaire.

We tested our hypotheses in the context of an application case for the eID card at a German university. In collaboration with the university's IT service provider as well as based on an online research, we identified several possible services in which an eID card could be used. We presented these possible applications in our questionnaire asking the participants for their assessment. Our items were developed from previous studies of e-government respectively IT adoption.

Our survey was structured as follows: The first part contained the introduction and introductory questions in which we gave an overview of the topic and asked general information about the participant. This was followed by questions on the assessment of the eID concerning perceived ease of use, perceived risk and perceived usefulness as well as questions concerning the frequency of eID usage and the level of satisfaction. Afterwards, we presented possible applications. We identified the services Single sign-on (SSO) and signing forms electronically as well as the application and enrolment process. Participants were asked for their assessment of the variables of our research model. The item scale for our constructs was a four end-point scale (ranging from strongly agree to strongly disagree). Afterwards, we recorded the information need and the influence of communication by querying which factors the participants would like to be informed about through which channels (assuming that the eID service was implemented at the university). In the final part, we collected demographic data and allowed for comments. Completing the survey took about 15 minutes. As an incentive to take part, we gave away three Amazon gift cards.

We pre-tested the survey in several rounds. First of all, an expert from the IT service provider checked it for logical mistakes. We conducted the first round of pre-tests while we were present. The second round of pre-tests was sent via e-mail. As this only led to few changes, we launched the survey afterwards. We sent an invitation link to the online survey to all employees and students of the university via e-mail, which are about 45,000 persons in total. Filter questions ensured that the different target groups would only answer questions relevant to them.

We analysed our data with the aid of Excel for descriptive statistics as well as with SPSS for correlation analysis and linear regression. Besides calculating the Spearman correlation, we ran a regression analysis for the influencing factors of behavioural intention and perceived usefulness.

4 Data and Results

The questionnaire was implemented in an online survey tool and was open from June 26th to July 10th. Overall, 1,632 students participated and completed the questionnaire. 37% of the participants stated that they have the new ID card, 35% of these additionally have activated the electronic functionalities of the eID and 29% have an

appropriate card reader to use these functionalities. This is in line with the number of new eIDs and released electronic functionalities in Germany in general. [30]

One important aspect for the evaluation of the results was the level of information the participants have regarding the eID. In all aspects we asked for, less than 25% of the participants answered that they are very good or good informed (cf. Table 1).

Table 1. Level of information about the eID card (1=very good to 4=not informed)

Level of information	1	2	3	4
eID functionality	3.01%	15.82%	42.24%	38.93%
eSign functionality	4.50%	20.12%	36.10%	39.28%
Security aspects	2.97%	14.58%	34.48%	47.97%
Fields of application	4.36%	14.14%	34.31%	47.18%
General level of information	2.45%	13.72%	50.07%	33.77%

For assessing the influence of the social context on the behavioural intentions one main aspect was the importance of different sources for information about the eID card in general. We did not divide the sources for information further in subsets like source for information for applications or for security aspects. Regarding the source of information the participants build their own opinion on, the results show that they count on official information and information of newspapers as well as information from their direct social environment like family, friends or colleagues (cf. Table 2).

Table 2. Source of Information, the participants build their own opinion on (1=very important to 4=not important)

	1	2	3	4
Official sources	46.00%	38.22%	11.67%	4.11%
Newspapers	22.21%	49.89%	21.99%	5.90%
User suggestions	10.98%	25.30%	36.37%	27.35%
Suggestions of family and friends	21.12%	46.33%	25.38%	7.16%

In the following we will exemplary concentrate on the last case as the results for all three cases are by trend the same. Overall, 58% of the students state that they would use the eID card for an online application at the university (categories 1 and 2 of 4 on a scale from “most likely” to “no”) and 19% would not use eID card for a completely electronic application process (category 4). Furthermore, 57% of the students think that their family or friends would use the eID card for the application process and 12% think that their family or friends would not use it. Condensing the further questions regarding the scenario of complete online application and calculating the correlation based on Spearman we determine an influence for every of our hypotheses H_1 to H_{10} (cf. Fig. 2 and Table 3).

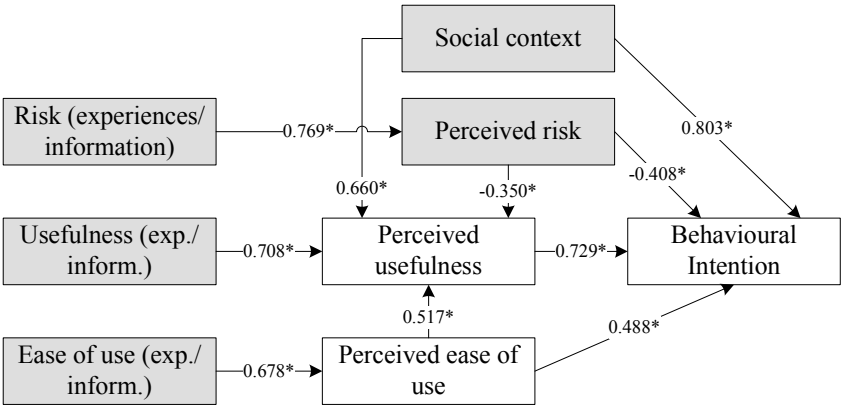

Fig. 2. Spearman Correlation of factors on behavioural intention of students to use the eID card for online application for a university place (0.01% level)

Table 3. Spearman Correlation for scenario of complete online application for a university place (0.01% level) for hypotheses H_1 to H_{10}

Hypothesis	H_1	H_2	H_3	H_4	H_5	H_6	H_7	H_8	H_9	H_{10}
Spearman	0.729	0.488	0.517	-0.350	-0.408	0.660	0.803	0.743	0.708	0.678

Additionally, we performed a regression analysis for perceived usefulness and behavioural intention to use the eID card. Perceived usefulness has an R2 of 0.722. The social context has a high influence on the perceived usefulness; the perceived risk has a small influence on the perceived usefulness. Additionally, the usefulness in general also has a high influence. BBehavioural intention also shows an R2 of 0.722. Here, too, perceived risk has a rather small influence while the influence of perceived usefulness and of social context have a high influence. Additionally, perceived ease of use does not have a noticeable influence on behavioural intention to use the eID card for the online application for a university place.

From the set of demographic aspects, only the individual computer skills have a significant influence on *behavioural intention* to use. However, even in this category, behavioural intention to use the eID for online application only slightly depends on the level of computer skills as it ranked smoothly between 61% (very good skills) and 50% (low skills)

We asked for indicators of *perceived usefulness* in every usage scenario. Based on the hypothetical process of a complete-online application, the students said that it would be a useful, easy and fast alternative to the classical, (partly) paper-based way. However, they do not see any improvements in safety issues and are indifferent regarding financial issues (cf. Table 4).

Finally, we asked for communication aspects to prove the influence of communication on the behavioural intention to use the German eID. Overall, about 60% of the students indicated that they (most) likely think that their attitude regarding the eID could be influenced through communication of the university (cf. Table 5).

Table 4. Perceived usefulness of the eID card for online application at university (1= strongly agree to 4=disagree)

	1	2	3	4
Useful alternative	35.43%	34.70%	16.00%	13.87%
Fast alternative	40.28%	37.04%	13.51%	9.17%
Easy alternative	24.95%	40.53%	21.15%	13.37%
Safer alternative	8.11%	18.68%	36.42%	36.79%
Cheap alternative	18.84%	30.81%	24.82%	25.53%

Table 5. Possible influence by university's communication about eID (1=most likely to 4=no)

	1	2	3	4
Possible influence by communication about eID through university	10.44%	49.72%	29.33%	10.51%

Further results show that students wish to be informed by university about security aspects of the eID (80%), university's online services for the eID card (72%) as well as about the general functionality (72%). Only 10% do not want to get information about the eID card by their university. Regarding the preferred channel, students want to be informed by mail (74%) as well as the universities website (74%) or the website of the universities IT provider (66%). They do not want to get information via the social websites of the university (e.g., the Facebook page of the university).

5 Discussion

It is striking, that the results show a low level of awareness about functionality and fields of application of the new eID card but a significantly high interest in this new technology resp. services. To add, this interest in this rather new technology even only slightly depends on individual technical skills.

However, the low level of awareness firstly has to be ascribed to the governmental level as governments should have a high interest in informing the people about the functionality and services of the eID. If students increase using their eID card for university services and provide all their information and applications digitally, process costs within the universities will be reducible in the future. This would not only be true for universities but also for other organizations with high rates of document processing like governments, insurance companies, or banks. They all provide various services which would benefit from complete digital processing. It would help to optimize business processes to provide faster and thus cheaper services to their customers.

Furthermore, our results show that the participants prefer several channels for information about the eID card and services around. They not only seek for information from official sources or newspapers, but rely heavily on the opinion of the social environment about the eID card and its related services. Within our correlation analysis the influence of the social context on the behavioural intention to use the eID card for the online application is very strong, which is conform to

previous research. This is an important finding as this should have an influence on the information and communication strategies of the stakeholders of the eID either being the governments or being further providers for services around the eID like a university.

It is striking that only one third of the citizens which have a new eID card activate the electronic functionalities. This reduces the actual amount of potential users for services relying on the eID functionalities to only about roughly 10%. This, furthermore, raises the question about the reasons for this low adoption rate. Recent research shows that various aspects have an influence on this acceptance rate. Besides technical, environmental, service and user characteristics, trust and communication have to be mentioned here. [31]

Our results presented in Section 4 show, that the ease of use (technical and service characteristics), the social context and skills (environmental and user characteristics), security issues (trust) and communication have a significant influence of the behavioural intention to use the eID card at university. To underline this, the participants furthermore explicitly mentioned security concerns as main reasons for not using the eID card, the feeling of less information and the fear of increase in complexity. However, based on our results, many of the participants see the eID card as a useful, fast and easy alternative to the actual way of applying for a university position. This shows the importance of targeted communication efforts to explain the potentials users the advantages of the new technologies.

Of course, we cannot transfer this impression of ease of use directly to other services ready for eID cards. However, in our example case it underlines the importance of the further influencing factors, i.e. trust and the already mentioned targeted communication. From our perspective these two factors interrelate to some extent. On the one hand, for sure, the eID itself as well as the services build upon the eID card have to be secure in terms of privacy of data and protection of data loss, which goes along with further results [9], [21], [22]. On the other hand, the central government needs to declare that the underlying techniques are safe. One interpretation based in this could be that the central government is either not trustable from a citizens point of view and citizens do not believe in the communication of the governments or the central government is not able to communicate the security of their techniques and services in the right way. Following on this service providers like a university also encounter problems in communicating the safety of the technology. Recent research thoroughly allows for the conclusion that there are deficits in the communication efforts of governments. [11] Therefore, improving the way of communication would help to increase the acceptance rate of eID-supported services.

Additionally, our results show that it is not only important that the central government as provider of the eID card informs and communicates the possibilities, services or security aspects. It is also up to the university as (potential) provider of concrete services itself to inform about these aspects and provide information about the single service as well as the overall techniques behind.

To sum up on this, a holistic concept is necessary in which the information strategies of the central government and the university as representative for the single service providers are aligned. Our results show that the citizens, i.e. the students, feel uninformed about the possibilities of the eID card. Additionally, this concept has to

reflect the importance of the social environment of every single (potential) user. For example this leads to a somehow grassroots approach, were users are stimulated to foster their friends and colleagues to also use the eID card for services available. The university resp. the service providers here have the advantage that they are to some extent closer to the customers. It is easier for them to perform targeted communication, dedicated to the special needs of the (potential) users. Close interrelation between these stakeholders is obligatory. From our perspective, this could be one way to breach the chicken and egg problem we are facing. On the one hand there are less (potential) users because of few citizens activating the eID functionality. So actually it is not that promising for service providers like the university to adapt their authentication services to the eID card. On the other hand citizens are hesitating to activate this functionality because of only few services actually available, neither at university nor at public administrations.

6 Conclusion

Our analysis pretty well shows the actual dilemma the central government and service providers which offer the new eID card and services related are facing. On the one side the problem of few services available and on the other side potential users struggling to activate and use the services because of less possibilities to use. One main reason which could be synthesized is the feeling of lacking information the students participated in our survey expressed. So our main conclusions and answer to our research questions are that a better, targeted communication and the inclusion of the social context of the (potential) users could be key factors for improvement.

As such our study contributes to the actual body of knowledge. We were able to confirm related work in technology acceptance research in confirming and extending the existing theories and models, especially in our case research related to the TAM. We especially focussed on the aspects of communication and the social context of the users. Additionally, as implication for practice, we synthesized from data that central government together with their aligned service providers have to extend their communication concepts, targeted to single user groups, to enhance their actual efforts and achieve better results in terms of eID adoption. We especially were able to prove the strong influence of the social context on the attitude towards eID services.

Our study has a number of limitations which should be followed by further research. We focussed on the field of services combined with an eID card in the university context. Furthermore, we limited or work to exemplary services within a university environment. On the one hand this limits the generalization of our findings; on the other hand this was necessary to handle the complexity of the field to a level which was understandable for the attendees of the survey.

Further research should flow in two main directions. Firstly, the results achieved in the university context have to be extended to further services which are relevant for an eID card application. This has to be done in the university area as well as for services of public administrations and private organizations. The purpose would be to further approve the findings and make them generalizable. Secondly, the aspects of

communication and the inclusion of the social context into the communication strategies and concepts have to be conducted and applied. This application subsequently has to be evaluated from a scientific perspective to ensure an integrated prove of the findings of our work.

Acknowledgements. We would like to thank Adrian Beheschti, Lisa Eckey, Heinrich Hüppe, Magdalena Lang, Philipp Simon, Fritz Ulrich, Patrick Vogel and Till Weber for their dedicated effort in conducting the study.

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Social Media and Government Responsiveness: The Case of the UK Food Standards Agency

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Abstract. Social media are often regarded as a set of new communication practices which are likely, if deployed effectively, to make public sector organisations more responsive to the various stakeholders with whom they interact. In this context, responsiveness is usually approached as an administrative function of establishing additional channels of information and responding faster to citizen queries. Notwithstanding the importance of these objectives, this study aims to reconceptualise the relationship between social media and government responsiveness. Drawing on current literature and the case of the Food Standards Agency in the UK, the study identifies new dimensions of social media responsiveness. The findings of this study can provide useful insights both for researchers in the area and those in the process of developing social media strategies in government.

Keywords: Social Media Adoption, Government Responsiveness, Open Government, UK Government, Food Communication, Case Study.

1 Introduction

Although a responsive government is praised by everyone, the various aspects of this concept are not always clear [22]. Broadly, being a responsive government could mean "responding easily to any and all demands" or entail democratic dimensions such as "reflecting and giving expression to the will of the people" [20].

As a growing number of government organisations are in the process of social media adoption, the anticipated benefit of improved responsiveness is usually an important motivation. In this context, social media responsiveness is likely to be centred on administrative functions such as increasing direct interactions with citizens, replying faster to queries and providing opportunities for stakeholders to access, share and comment on government information [10], [21], [24].

The aim of this paper is to examine the relationship between social media and government responsiveness. While the paper does not challenge the positive impact of social media on government responsiveness *per se*, it posits that this relationship requires a more comprehensive examination. Government responsiveness is not just administrative aspects of information provision or responding to public demands for

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 310–321, 2013.

information and action. Complementary views of responsiveness emphasise the ability to listen to the public and respond in a collaborative and consistent manner, e.g. [26], [27]. Few studies of social media in government have so far touched upon these aspects of responsiveness [14], [17].

The paper reports on the case of the Food Standards Agency (FSA), which is the government body responsible for food safety and food hygiene across the United Kingdom. The FSA's approach illustrates how social media can contribute to responsiveness with initiatives that promote positive behavioural change to the public, reach specific target audiences and demonstrate proactive commitment to food safety. The next sections develop a more detailed conceptualisation of government responsiveness after positioning the concept within current work. Following the methodology and case background, the paper discusses the FSA's approach to social media. The outcome of this discussion provides a springboard for future research in the area, as well as assisting policy makers in delineating the value of social media in this context.

2 Background: Social Media in Government

Broadly, the use of social media in government has been associated with openness, transparency and even anti-corruption e.g. [2], [3], [4]. When it comes to impact on micro-interactions between citizens and governments, social media bears high expectations in terms of responsiveness. This includes expectations to reply instantly to queries, provide continuous updates of information and be prepared to engage with the public on emerging issues. While this potential might be fulfilled in certain cases, high expectations of responsiveness have mostly proven unrealistic. Such expectations may be a key reason explaining why government organisations do not generally use social media, as specific incidents of government non-responsiveness on social media can be explicitly highlighted by the disappointed public [18]. In turn, even if government organisations appear responsive, the public might not always respond as intended. This phenomenon has been identified as a form of technical rationality, which assumes that citizens will engage more if the government finds them where they are, online [1].

At the strategic level, looking at the processes of social media adoption in government points to why responsiveness remains an important aim that is difficult to conceptualise and practice. Social media practices are likely to be initially diffused in government organisations as an outcome of entrepreneurial activities launched by actors who seize sparse opportunities [17]. At the beginning of such initiatives, social media are likely to be used to complement existing channels of information dissemination before becoming spaces of interaction and more standard practices. As this process matures and interactions via social media increase, information policies and regulatory frameworks usually struggle to cope with the public's expectations for responsiveness [2], [4]. The volume, complexity and fast pace of social media interactions require not only more formal policies but also an adaptation process that is likely to be in tension with bureaucratic structures of governance [18].

A balanced account of responsiveness also needs to consider that social media cannot be treated as a single entity or even a set of tools with interchangeable properties. The value proposition of different social media applications usually conveys different expectations of responsiveness in different government domains. Each value proposition matches the use of tools and channels of interaction with different engagement audiences and intended added values [19]. For example, microblogging applications such as Twitter are usually considered a catalyst of increased responsiveness due to their immediacy and real-time nature [29]. Other tools such as blogs serve diverse purposes of more in-depth engagement with the general public or specific groups of experts [15].

3 Conceptualising Responsiveness

In the business world, responsiveness to the communication needs of different stakeholders - including consumers - has been at the core of how organisations leverage value. Meehan and Dawson [16] emphasise that responsiveness is about getting it "fast and right". The route to demonstrating timely and effective responsiveness requires certain elements of learning - such as the ability to balance risk tolerance and speed - that cannot always be found even with major consumer-focused organisations. Zaheer and Zaheer [31] note another important dimension by explaining that alertness as proactive attentiveness to information is closely related to responsiveness. Research has also shown that website design features can have a direct impact on organisational responsiveness to stakeholder information needs [11].

That government responsiveness is an objective worth pursuing is generally accepted since it relates directly to citizen's perceptions of being able to influence government decision making [12]. A variety of policy and cultural factors can shape people's perceptions of government responsiveness [28]. Vigoda [28] synthesises different views of responsiveness that focus on performance or the ability of large bureaucracies to apply general management practices in their effort to serve the public. Bureaucrats could be considered responsive because of choosing business-like methods to fulfil their responsibility to the public [26].

Current literature tends to emphasise that high levels of social media maturity in government are associated with the ability to enhance information dissemination, timely responsiveness to the public and, at later stages, to engage with them e.g. [13]. High expectations of responsiveness are commonly reflected in measures of interaction (e.g. Twitter mentions) and reach of information shared (e.g. retweets). For example, exercises labelled as crowdsourcing, whether invited by governments or conducted in a less mediated way, are usually approached as complicated technical challenges where massive input from the public can provide useful insight e.g. [25]. Similarly, use of social media is related to the government's ability to monitor and respond to public safety or emergency issues in a timely fashion e.g. [10].

Notwithstanding their importance, these uses of social media in government usually account for an administrative view of responsiveness or improving the government's ability to react to the public. A complementary view of responsiveness

emphasises the capacity to listen, facilitating an understanding of the audience and promoting new ways of engaging [26]. Commitment to listening not only improves the government's ability to react but also enhances its role to create public value. This marks what Vigoda describes as a shift from administrative to collaborative responsiveness [27]. Collaboration not only in terms of increasing direct interactions but also in terms of the government's ability to change behaviours and engage proactively.

So far, few studies of social media have explored this potential of government responsiveness or linked it within practical contexts of use. Linders [14] draws on a similar perspective by discussing new models of interaction where social media support the government's efforts to be proactive, monitor public wellbeing and promote positive behavioural change. Mergel reports [17] on empirical data gathered from social media directors in the USA federal government who identify the potential for networking as a desirable goal that could support a "highly interactive and bidirectional" type of responsiveness (p.6). However, interviewees were not able to point to the specifics of how such a networking strategy can take place. Therefore, beyond using social media to support administrative functions, other forms of government responsiveness merit further attention and empirical investigation.

4 Case Background and Methodology

To empirically examine how social media can make public organisation more responsive, a single case study approach was selected based on a critical or unique case [30]. The case of the Food Standards Agency (FSA) was selected due to its distinctive features in relation to the aim of this study. This relates to the structures and communication needs of the FSA, combined with its approach to social media which takes into account different aspects of how the agency could enhance its responsiveness to the public.

Given that everyone has a stake in food, it is not surprising that the communication structures and needs of the FSA are quite complicated and multi-layered. The agency has departments in Scotland, Wales and Northern Ireland and is responsible for communicating with the public about a variety of issues related to food consumption, transportation, storage, safety and hygiene. As the principal food governance body in the UK, the FSA interacts with a wide range of stakeholders who have professional interests in food, for example, experts in nutrition, health scientists, journalists and organisations in the food industry (e.g. supermarkets). Also, the FSA collaborates with other national and European food governance authorities, as well as local government authorities about the hygiene rating of eating facilities. Finally, the agency organises consumer surveys about eating habits across the UK.

Further to the more routine aspects of food monitoring, inspection and regulation, the work of the agency often requires the handling of food safety crises, which are becoming very important in Europe e.g. [9], [23]. A high-profile crisis in which the FSA has been recently involved is the Escherichia Coli outbreak in Germany and other parts of Europe (summer 2011). Also, since the beginning of 2013, the agency has been involved in a crisis stimulated by the detection of horsemeat traces in beef

products. The 'horse meat crisis' at the UK and European level has been raising significant public interest about food safety issues and the activities of the FSA to support and protect consumers.

Due to these diverse and broad communication needs, the FSA's approach to social media was, *a priori*, a significant challenge. The agency needs to demonstrate responsiveness in communicating with the diverse audiences with which it interacts. Evidence of the FSA's online presence indicated that due to its specific conditions, the organisation was using social media to be responsive in many different ways. For example, the agency was using its YouTube and Twitter accounts to promote healthy eating habits and advise the public about food safety. Therefore, there was scope to examine the formulation and course of this approach as a case that can inform future practice. Data collection for this study included the following sources:

- Documentary data related to statistics about questions received by the FSA, the remit of the FSA in food governance, its broader role, strategic mission, history and stakeholder groups. This included statements about communication needs and structures using offline and online channels. Most of these sources were available online through the FSA's website or other UK government sources.
- Online data sources from websites and social media sites, with an emphasis on YouTube, Twitter and Facebook. This included examples of responses and content monitored by the agency, audience characteristics, online critics, supporters of the FSA's work, etc.
- Four interviews with officials from the FSA including a research presentation focused on consumers' perceptions of food information. The interviews were conducted in 2012 and were complemented by further telephone and email exchanges. The interview findings were coded thematically and cross-examined with the documentary evidence and online sources. The focus of the interviews was on four main questions:
    1. What are the communication needs of the agency and what kind of questions and comments are usually received by the public?
    2. Which channels are used for receiving questions and comments from food consumers or initiating discussions with them? How are response processes organised?
    3. What is the agency's commitment to answer questions related to food risks and benefits? How is this commitment affected by food safety incidents or crises?
    4. How have social media changed the way the agency communicates with the public?

5 Social Media and the UK Food Standards Agency

At the heart of the FSA's communication activities is the aim to help protect consumers and improve food safety. Long-term food-related problems in the UK range from high levels of obesity to major food safety incidents. Apart from people's

well-being, these issues can negatively affect the UK economy, as was the case with the BSE crisis in the 1990s (known as the "mad cow" disease). The work of the FSA is further complicated because, although everyone eats on a daily basis, food policies and regulations require elaborate scientific evidence, continuous monitoring (e.g. meat audit) and close collaboration with European food authorities. Despite these challenges, consumers have a legitimate interest in understanding, influencing and seeking explanations about food policy decisions. Consumers also require support in their everyday eating habits such as advice about food risks and benefits. One of the FSA's main actions to support consumers is the Food Hygiene Scheme, whose ratings range from 0 (improvement urgently needed) to 5 (very good). All food premises are encouraged to display these stickers and certificates in a visible location. Further to routine support of consumers, the FSA needs to attend to specific seasons when eating habits change, for example, during Christmas or Easter holidays.

Before the use of digital media, the FSA's campaigns to influence eating habits and promote food safety were located within costly media advertisements with limited feedback and targeting options. Also, the agency was not able to discuss and engage with consumers on a more regular or routine basis. Helplines were in place for queries such as helping the public address food labelling and hygiene issues to the appropriate authority (which is not always the FSA). Mobile phone messages and mainstream media were used to issue warnings about product recalls and allergies, sometimes as a matter of urgency.

5.1 Digital Media and Food Communication

Table 1 provides an overview of the main digital communication tools used by the FSA. The agency maintains a large variety of channels for information dissemination, social bookmarking and networking. Apart from the main website, the FSA has organised training websites and an open access repository for food-related documentation. Also, the agency has decided that all Board meetings that produce food policy decisions should be open to the public. Since 2003, Board meetings are available through live webcast including a public questions and answers section.

With regards to social media, emphasis has been placed on the YouTube channel and the Twitter feed. Twitter is used to alert about new content and invite people to provide feedback about specific issues. Conversations with other Twitter users take place regularly, on certain occasions even initiated by the agency's account when relevant conversations are identified. An important part of the digital strategy is also the Chief Scientist's blog which communicates about scientific issues (e.g. food sampling and testing).

Email alerts and RSS feeds have complemented traditional alerting systems about product recalls and allergy warnings. More recently, mobile applications have been used for hygiene ratings and allergies alerts. Social bookmarking and visualisation tools such as Pinterest and Thinglink have been explored as ways to support thematic campaigns around holiday seasons and provide interactive calendars. Finally, the agency uses the internal networking tool Yammer (about 900 people). Yammer is used for internal information sharing and collaboration between FSA employees and even external stakeholders.

Table 1. Overview of digital communications used by the FSA

Communication channels	Use and objectives
Main website	The main website *food.gov.uk* acts as a central point of information, contact and debate about wider issues related to food hygiene and safety.
Training websites	The website *allergytraining.food.gov.uk* provides training, facts and resources about food-related allergies. The website *vacuumpackingtraining.food.gov.uk* provides training for enforcement officers.
Open access repository	The open access repository *foodbase.org.uk* contains all documentation produced by the FSA including scientific studies and reports of research conducted with the public.
Chief Scientist blog	The agency's chief scientist maintains a blog named Hungry for Science. The aim of this blog is to communicate food-related scientific issues to the public such as and sampling and testing procedures.
Facebook groups	Facebook groups are used for regular communication and special thematic campaigns such as the "Food Safety Week" and the "Food Hygiene Rating Scheme". There is also a separate page in Welsh, or Cymraeg, for Welsh language speakers.
Twitter feed	The Twitter account is an important part of the agency's social media strategy with over 10,000 followers, many of which are food professionals and experts. Additional Twitter feeds might be used such as the @playitsafefood during the London 2012 Olympics or special hashtags such as the #FHRS for the Food Hygiene Rating Scheme.
YouTube channel	The agency has used YouTube since 2006 with over 70 videos and 210,000 views. Most videos are about food safety training such as hand washing for professionals and cooking safety advice. Many of these videos are embedded in the agency's website in specialised pages that include guidance and information (interactive training tools).
Email alerts and RSS feeds	RSS feeds and email alerts are used for food recalls, allergy warnings and stories related to the work of the agency in Scotland, Wales and Northern Ireland.
Live streams	The agency's Board meetings are broadcast and archived with the option for the audience to submit live questions.

Table 1. (*Continued.*)

Social bookmarking and presentation tools	The agency uses Pinterest as a visual bookmarking tool. Boards created centre around general food issues or galleries for family food planning, Food Safety Week and a food calendar for the Christmas season. Thinglink is another tool used for interactive images such as food calendars. Infographics are also used for thematic campaigns.
Mobile applications	The agency uses mobile applications for the hygiene rating scheme and allergy alerts. The applications are available on different platforms (Android, iOS and Windows).

5.2 Social Media Interactions

It is important to consider the impact of these channels on the agency's traditional interaction with the public. Online information channels make it easy to find factual information about policies, food issues and the work of the agency. As a result, previously simple questions have been replaced by more complicated queries which require evidence from multiple sources or even expert consultation in order to be answered. Consumers and food professionals use Twitter and Facebook to seek detailed information about policies or clarifications for regulations. Examples of such queries include nanotechnology, the labelling of specific ingredients and differences between product expiry dates.

Commitment to respond to questions is implicit but the responses are well communicated on social media channels. Usually, an immediate response acknowledges the issue and then a detailed response is provided after investigating the matter. This builds on a broader protocol of main principles about how to handle questions on each channel (Social Media Response Assessment). For example, phone queries are traditionally responded to within three days but social media demand more immediacy and flexibility. Commitment to respond and engage has been made explicit to the public through a social media use policy and guidelines [6], including a separate page for Twitter [7]. Questions are likely to increase when potential food safety issues, such as the horsemeat crisis, arise. On such occasions, social media can be effective and transparent as previously one-to-one questions on helplines can evolve into one-to-many or even many-to-many conversations.

Further to the response processes, an important part of the FSA's approach to social media is gaining an advanced understanding of the audience and building relationships with specific groups. This objective is directly driven by the mission to promote safe and healthy eating habits. A proactive approach to audience understanding and relationship building is emphasised in the organisation's strategy. At the operational level, it is enabled by the use of social media monitoring tools and dashboards, which provide the "listening" infrastructure to intervene and engage. Conversations about food take place on a regular basis and understanding the stakeholders involved and their networks is considered the first step to cultivate relationships with them. Relationships usually start with simple online actions such as

"retweeting", "mention", "like" or "pin". These actions can then be escalated into more permanent ones such as "followers" or "friends".

Whether these relationships are established on an ad hoc or regular basis, network effects can support the agency's aim to share key messages and campaigns about food issues with a diverse audience. This relates to public awareness and building trust with different groups of key influencers such as allergen charities, consumer organisations and networks of food professionals. It also relates to reaching consumers with specific demographic characteristics such as students, the elderly, mothers and teenagers. Interviewees were able to provide specific examples of how the digital networks of key influencers were used as a platform to promote the FSA's campaigns. Support comes from simple actions such as retweeting a message to more elaborate forms such as providing scientific evidence and expert opinions. For example, regional issues are addressed with the help of local government authorities and consumer organisations provide support for healthy eating. This networking tactic builds on the agency's traditional authority over food issues that guarantees high visibility through digital channels.

Furthermore, monitoring and network alertness can support proactiveness when food safety incidents take place. A well-known case is when the agency used a dedicated social media dashboard to receive alerts over emerging risks during the London 2012 Olympics [8]. Following a rumour that the Australian and Canadian badminton teams were falling ill with food poisoning, the agency intervened quickly before the escalation of the incident. Eventually, the cause was not a virus from a food source and the cases were limited to five members of the Olympic teams.

6 Discussion and Conclusion

The aim of this paper is to examine the relationship between social media and government responsiveness. Current work suggests that social media have been related to different aspects of government responsiveness such as expectations to provide information and responses to the public. Beyond these aspects of administrative responsiveness, these are other dimensions of the concept where social media can be of added value.

The case of the Food Standards Agency provides insight into elements of social media responsiveness based on listening, networking and collaborative aspects [26], [27]. More specifically, the case points to the following directions:

1. *Managing expectations of responsiveness*: responsiveness requires keeping social media activities focused and consistent, such that it is clear for the public how and when interactions can take place. Apart from providing explicit policies and guidelines, this needs to be demonstrated in terms of commitment to, and consideration of, responding fast and responding right [16]. The FSA has managed to maintain a good balance, which will certainly be challenged if the volume of interactions increases.
2. *Audience and network awareness:* the FSA's targeted approach to reaching groups of consumers and food professionals shows how responsiveness is

not about the volume of interactions but the ability to be responsive to specific audiences for specific purposes [22]. For example, 10,000 followers for the agency's Twitter account is not an impressive figure on its own but the added value of Twitter has been important in reaching the networks of contacts and promoting campaigns.

3. *Proactive monitoring and alertness:* using social media as information sources can inform the FSA about public sentiment and emerging issues, but only when they build on understanding specific audiences. General feedback mechanisms, no matter how technically sophisticated they might be, cannot provide useful and actionable insight if they lack understanding of the audience.
4. *Promoting positive behavioural change:* responsiveness to frame public perceptions through digital media suited well the FSA's existing communication style and mission. A wide range of means such as mobile applications, video sharing and interactive training tools are used to educate the public about food hygiene and safety. There is considerable scope to use social media for government activities that promote public education.

Despite its importance, the case of the FSA does not aim to provide an exemplar of responsiveness enabled by social media. Even if the FSA has not realised the full potential of social media, its emphasis on non-administrative elements and network awareness provides useful directions for practice. The FSA's rapid progress and well-considered social media development plan worth attention by government departments in similar processes. However, within the contextual limitations of this case and beyond, there are certain caveats to the concept of social media responsiveness that have to be made explicit.

An important limitation is that how citizens make sense of government responsiveness is a complicated matter [28]. Especially in the case of the FSA, people might assess decisions about food policies along single dimensions while the work of the agency involves complicated scientific and regulatory issues. For example, meat audit is not always within the remit of the FSA authority due to European regulations. As Mergel notes [18], the real challenge lies in assessing the actual influence of government initiatives beyond the number of people engaging with them. Brand reputation metrics used by commercial social media monitoring solutions are not likely to provide good indicators of responsiveness if not closely aligned with a public sector organisation's key mission to influence and engage.

Another inherent limitation to social media responsiveness is that those people most likely to engage on social media do not represent the general public. For example, in many of its initiatives, the FSA seeks to reach people with below average socio-economic status as they are more likely to have less healthy eating habits. Studies with the British population show that socio-economic status is associated with higher content creation in social networking sites than online means such as blogs [5]. Therefore, initiatives that focus on eating habits could be targeted accordingly. Not only it is difficult for government communicators to assess these new aspects, but also they have limited control over them.

As social media use in government matures, future work can elaborate on the dimensions of government responsiveness and examine what responsiveness means to

specific groups of the population who engage in social media activities. Social media users might not always represent the general public, but they do open significant opportunities to improve citizen-government interactions and inform policy development.

Acknowledgments. The authors gratefully acknowledge interview participants from the Food Standards Agency. This research was supported by the FoodRisC project under the Seventh Framework Programme (CORDIS FP7) of the European Commission (grant number: 245124).

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Online Forums vs. Social Networks: Two Case Studies to Support eGovernment with Topic Opinion Analysis

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Abstract. This paper suggests how eGovernment and public services can apply "topic-opinion" analysis (developed in the EC IST FP7 WeGov project) on citizens' opinions on the Internet. In many cases, discussion tracks on the Internet become quite long and complex. Stakeholders are often interested in gaining a quick overview of such a discussion, including understanding its thematic aspects, identifying key arguments and key users. The topic opinion analysis that is part of the WeGov toolbox aims to provide appropriate summarization techniques by identifying latent themes of discussion (topics), most relevant contributions and arguments for each topic, as well as identifying the most active users that influenced a certain aspect of discussion. In this paper we focus on online forums and social networks as digital places where users discuss potential political issues. Therefore we setup two different case studies to validate the accuracy and usefulness of analysis results of the topic opinion analysis.

Keywords: eGovernment, Twitter, Facebook, Online Forums, Topic Opinion Analysis, Sentiment, Controversy.

1 Introduction

Governments and public institutions are increasingly working with citizens to give them more of a stake in the policy-shaping process, for example through public consultations on new legislation [5]. E-participation platforms foster communication and interaction between politicians and government bodies on the one side, and citizens on the other [5]. Notwithstanding the benefits brought about by existing eParticipation platforms, there remains the unsolved challenge of how to involve a larger number of affected individuals, groups and communities in discussions than is currently achieved through dedicated web sites. This problem has, for example, been analyzed with the 10 Downing Street Debate Mapper, being a case in point [6]. They found that very few people (7% of specifically addressed 309 invitees) took part using

M.A. Wimmer, M. Janssen, and H.J. Scholl (Eds.): EGOV 2013, LNCS 8074, pp. 322–334, 2013.

the dedicated Debate Mapper website, but many of them did comment about the same subject on other Web platforms.

The use of social networking platforms has a significant part to play in political engagement. Social Media [3] and blogs [2] have high potential for the eGovernment to interact with citizens. From a sociological point of view, platforms like Twitter are interesting for analyzing the dissemination of topics and as well for analyzing the opinions and sentiments of the society regarding particular topics [7]. Beyond that, online platforms have the power to influence the process of opinion making [2]. That's why [1] uses the label: "*new politics of listening*". For instance in the UK the Internet and social networks are everyday life functionality for Parliamentarians [6].

There is thus a huge potential of online discussion places, but there is a problem of making sense of the huge amounts of text in them. The aim of this paper is to suggest topic opinion analysis while validating to cases.to support eGovernment by exploiting the potential of online discussions and addressing the problem of "too much information". In the next section, we introduce the WeGov toolbox resulting from the EC IST FP7 WeGov project, and especially its topic opinion analysis component that provides summarization for political decision-makers. Subsequently we explain the process model behind this paper and describe two case studies that were selected to evaluate the topic opinion analysis with real data. Finally, we draw general conclusions.

2 Background

Both case studies that are described within this paper are based on the WeGov Toolbox as the technical framework. The WeGov toolbox supports diverse components for analyzing huge amount of online available text for stakeholders[1].

2.1 WeGov Toolbox

The WeGov Toolbox (hereafter "the toolbox") is a web-based system that enables the user to collect and analyze postings[2] and users from social networks and the HeadsUp forum. The toolbox is deployed and hosted at a server, and the user connects to this using their web browser. The key features of the toolbox are as follows.

- The user can specify and run searches on the social networks Facebook and Twitter, and raw data reflecting users' comments is collected.

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[1] Here we are referring to the definition from [17]: "*Any group or individual who can affect or is affected by the achievements by the organization's objectives*". Beyond that stakeholders within the context of this paper are potential end users of the WeGov toolbox within the field of politics and public administration.

[2] A posting (abbreviated post) is a digital user contribution within online forums, blogs or social networks. Generally a post is a text message. Here a post subsumes seed posts, status updates and comments.

  - On Facebook, the user can monitor public groups and pages - the user can instruct the toolbox to collect posts and comments on those posts from a Facebook group or page by specifying the URL of the page.
  - On Twitter, the user can search for keywords or hashtags.
- Searches can be scheduled, so that they repeat automatically. This is useful for collecting data over an extended period, which is particularly suitable for monitoring a news story. The system is designed so that when a search is executed multiple times by a schedule, it will not collect any duplicate posts, as duplicates can skew analysis results.
- Search results can be fed into the toolbox's two analysis components to provide summaries and automated insights into the (sometimes very large) data set returned from the social networks.
  - Behavior analysis has been developed by the Open University, Knowledge Media Institute (KMi), and monitors the discussion activity, categorizes users into behavior types and highlights key posts and users [11,12,13].
  - Topic-opinion analysis has been developed by the University of Koblenz [8], and determines themes of the documents (posts, comments, etc.) in the discussion by identifying sets of terms that frequently occur together in multiple posts and grouping them together into topic groups. In addition, opinions are determined by sentiment analysis, and the topic groups can be measured in terms of whether they express positive or negative opinion.
- We have adopted a methodical approach for the development process of the toolbox with frequent and iterative end user engagement, such as the German Parliament, the German State Parliament of North Rhine-Westphalia, the EC Parliament, city administrations, parties and NGOs [9] so as to get requirements and feedback on the toolbox's functions and usability [4]. As part of user engagement, a number of use cases were designed [16] showing how the toolbox analysis tools could provide a two-way dialogue with citizens, and the work reported here develops one of these use cases.
- An important aspect of the work in the WeGov project is to protect the rights and privacy of citizens and policy makers. To address this, a legal and ethical analysis was conducted to provide us with an understanding of data protection issues and give an insight into transparency. This work has influenced the design and use of all parts of the toolbox, and has been reported elsewhere [10]. The impact it has on the work here is that we only collect postings from publicly accessible sources.

2.2 Topic Opinion Analysis

In many cases, discussion tracks in social media become long and complex. Stakeholders of the toolbox technology (such as politicians, political researchers, active users) are often interested in gaining a quick overview of such a discussion, including understanding its thematic aspects, identifying key pro- and contra-arguments and finding the most influential users. However, completely reading

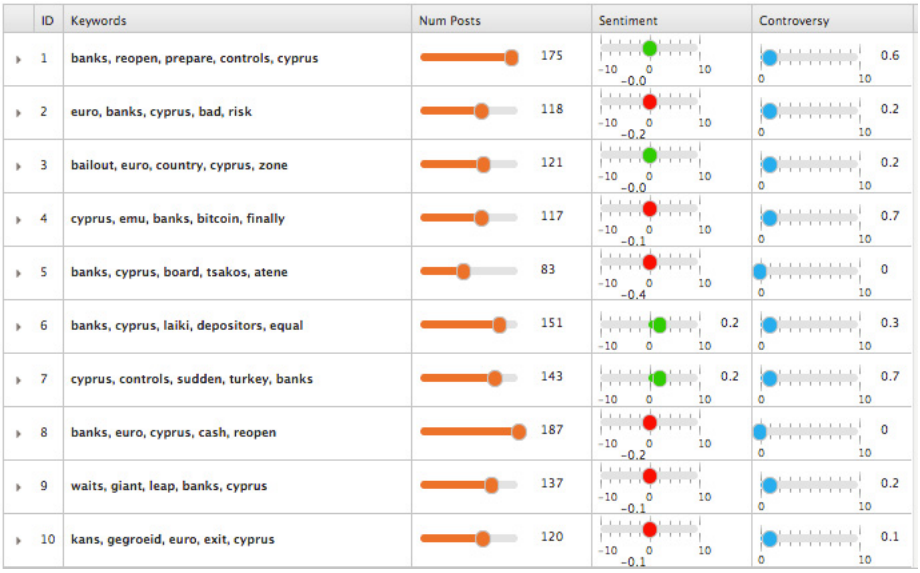
hundreds (or even thousands) of posts is too time-consuming to be practical. There is thus a huge need to summarize the discussion tracks, and the Topic-Opinion analysis component of the toolbox provides this by identifying latent themes of discussion (topics), most relevant contributions and arguments for each topic, as well as identifying the most active users that influenced a certain aspect of discussion. [8]. The topic-opinion tool employs state of the art methods of Bayesian learning and opinion mining [14,15] for finding the most relevant pieces of information that should be presented to the user, and the methods are briefly described next.

Modeling Topics: Probabilistic Bayesian models are used for mining the latent semantic structure of the online discussion. The toolbox approach can be seen as an extension to the state-of-the-art method named "Latent Dirichlet Allocation" (LDA) [14]. The collection of postings is represented by means of probabilistic distributions over terms (words) that appear in particular discussion postings with different frequencies. The analysis runs across many posts, and looks for words that occur together in the same post. Topics are formed from groups of words that frequently occur together in a post, and the more posts that contain the same group of words, the stronger the topic is. Each topic is therefore characterized by its most relevant terms. A post can be in more than one topic (for example if it contains words commonly occurring in two topic groups), and consequently, postings are represented by means of probalistic membership of topics (e.g. a post can be 50% in topic 1, 25% in topic 2 and 25% in topic 3). Postings that belong to a certain topic with high probability are considered as most characteristic examples for the certain aspect of online discussion. [8]

Modeling Opinions: The toolbox employs state of the art techniques for mining user opinions and affect states. Conceptually, they are based on structured vocabularies that indicate the emotional state of a post's author (e.g. skepticism, positive or negative emotions, anger, etc.). Consequently, postings with strong opinions or emotions are selected for presentation to the user. [8]

Topic-Opinion Summarization: Results of topic and opinion analysis are combined for presentation to the user. First, candidate postings are chosen with respect to their high relevance regarding particular discussion aspects (i.e. topics). Second, for each pre-selected posting, opinion/emotion analysis is performed. The output is constructed in such a way that a) all topics identified in the dataset are appropriately reflected, and b) postings chosen for each topic reflect different opinions and emotions. As a result, the output contains a limited number of "must-see-first" contributions from the online discussions, covering a broad spectrum of its contextual and emotional facets. [8]

Topic-opinion analysis is intended to provide quick summaries of the themes in a debate and the opinions expressed by the citizens on digital places. As an example of this, Figure 1 shows the topic analysis results when the input was multiple sets of responses on Twitter to the query 'cyprus'.



	ID	Keywords	Num Posts	Sentiment	Controversy
▸	1	banks, reopen, prepare, controls, cyprus	175	-0.0	0.6
▸	2	euro, banks, cyprus, bad, risk	118	-0.2	0.2
▸	3	bailout, euro, country, cyprus, zone	121	-0.0	0.2
▸	4	cyprus, emu, banks, bitcoin, finally	117	-0.1	0.7
▸	5	banks, cyprus, board, tsakos, atene	83	-0.4	0
▸	6	banks, cyprus, laiki, depositors, equal	151	0.2	0.3
▸	7	cyprus, controls, sudden, turkey, banks	143	0.2	0.7
▸	8	banks, euro, cyprus, cash, reopen	187	-0.2	0
▸	9	waits, giant, leap, banks, cyprus	137	-0.1	0.2
▸	10	kans, gegroeid, euro, exit, cyprus	120	-0.1	0.1

Fig. 1. Topic opinion analysis

Each line includes a list of five keywords that build the topic (e.g. “banks”, “reopen”, “prepare”, “controls”, “cyprus”). The next column shows the number of tweets that are sorted to each topic (e.g. 375 tweets for the first topic). The last two columns show the sentiment and controversy of tweets that are measured for each of the twelve topics. The indication of sentiment shows if the tweets that are related to one topic are rather positive, neutral or negative. The indication of controversy shows the ratio of positive and negative posts.

3 Applied Process Model

Figure 2 shows the applied process model how stakeholders were engaged, both to determine requirements and to evaluate the toolbox. The idea behind this approach is to identify potential use cases that are in the end users’ daily working lives. These cases are therefore of value to the end user, and can be used for validating the toolbox and its analysis results. Figure 1 shows two examples of such use cases (“HeadsUp” and “social networks”), and these are discussed throughout the paper to illustrate how the topic opinion analysis can be applied in everyday politics.

The top row in Figure 2 shows users on the Internet (the digital society) – for instance users of online forums or social networks. The second row shows stakeholders, and how they interact with the users on the Internet. In the use cases, the stakeholders already perform (often manual) analyses on the data they get from citizens on social networks. The results of their existing analyses are shown in the bottom row – here we call these data the “control group”. The control group is

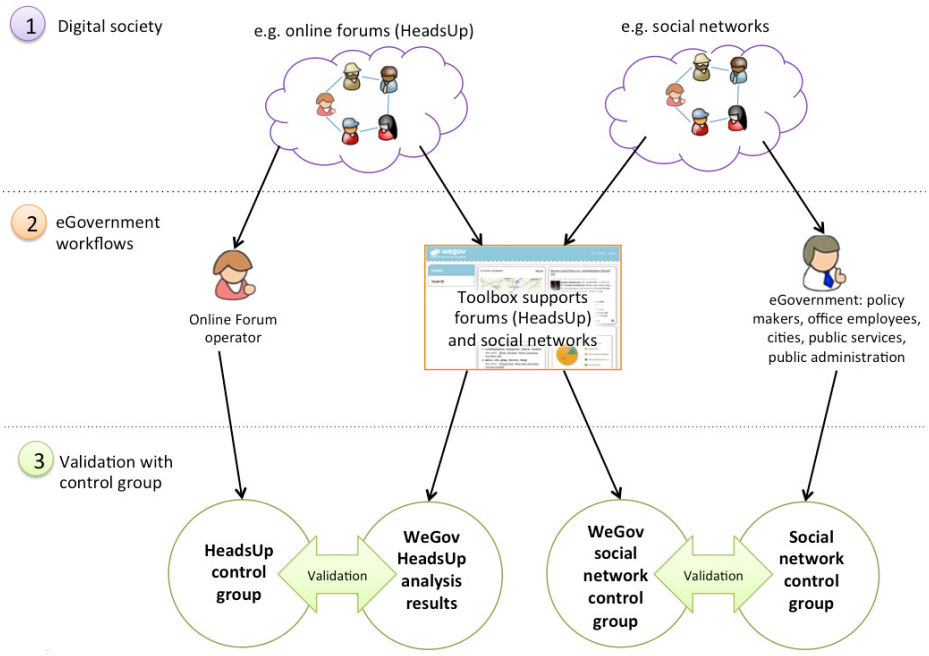


Fig. 2. Applied Evaluation Model

compared with the toolbox's analyses of the same data. For instance the operator of the HeadsUp[3] discussion forum (cp. left) analyses the forum discussions manually to get an insight on the debate. Another example is the policy maker (cp. right) who extracts topics from social networks to get insight into the discussion.

4 HeadsUp Case Study – Online Discussion Forums

Civil society groups run forums and blogs to connect with their members and supporters, but often analyzing the themes of these discussions is often beyond the organizations' resources. The toolbox could play an important role in helping small not-for-profit organizations, larger media organizations, as well as politicians and policy-makers to understand feedback across a range of communication channels.

HeadsUp is a UK initiative, launched in June 2003 to promote political awareness and participation amongst young people. It is an online debating space for 11-18 year olds that gives them the opportunity to debate political issues with their peers, elected representatives and other decision-makers.

Five debates happen each year, each lasting three weeks and are fitted around both the school and parliamentary calendar. The forum discussions are based around political topics of interest to young people, as well as those related to key political events, issues of debate in Parliament and the media, and current government policy.

[3] URL: `http://www.headsup.org.uk/content/` (Retrieved 13/3/13).

Each forum is supported by background materials and teaching resources to ensure that the discussions are of a high quality.

The discussions are analyzed by the Hansard Society and are summarized in a report, which is disseminated widely. The report contains the key themes of the debate with direct quotes from participants, other information about the forum and the political context at the time the debate happened.

The core reason for analyzing the forums and distributing the report is to allow young people to have their voices heard by those that make decisions on their behalf, and to highlight that their perspectives are often different to those of adults. This is a vital aspect of HeadsUp: the report provides a channel to feed back information from the forums to policy-makers, politicians and journalists; thereby allowing young people's perspectives to inform a wide audience of those with the power to effect change.

4.1 Methodology

HeadsUp was used to evaluate the usefulness of the toolbox toolkit with regard to forum data and it provided a case study using a real world data set. It was a useful test case because the reports of each forum were generated before the WeGov project was started, so they were a good, independent control group for comparison with the results emerging from the toolkit. Three forums of different sizes were used:

- Sex Education – Do you get enough? (36 posts)
- Youth Citizenship Commission: are young people allergic to politics? (317 posts)
- How equal is Britain? (1186 posts)

The output of the toolbox was compared to the forum reports to assess how well it determined the **themes of the debate** as analyzed by a human. The toolbox's assessment of **sentiment** was compared with the reports and a selection of posts was double-checked for accuracy by a human. The **user interface** and the options available to view the data were assessed for their usefulness when populated with forum data.

4.2 Findings

The toolbox has applications outside social networks. Comments from blogs and forums or other data sets could be analyzed using the toolbox. This could help both, small non-profits, or large media organizations to analyze large-scale interactions.

- The toolbox is best at dealing with large quantities of data, amounts that could not be analyzed effectively by a human without significant resources to do so.
- The toolkit performs well on relatively in-depth data - this lends itself to blogs and forums that encourage more considered and less immediate responses.
- The toolbox also performed well in showing the nuances between different elements of a wider debate e.g. the women's sport debate (sexism in sport & the types of sports played by men and women vs. mixed sports).

- The toolkit works best when analyzing medium length comments that focus on one issue and when spelling and vocabulary are good.

4.3 Improvements

- A plain English explanation of how the algorithm understands and processes data is very important to ensure users trust the results. An explanation of irregularities such as:
  - Why the same data sometimes yields different results?
  - Why keywords appear in the order and frequency that they do?
- Showing the hidden workings of the toolkit such as:
  - The relative influence of a greater number of key words e.g. via a tag cloud.
  - Highlighting positive/negative words that contribute to sentiment scores.
  - A separate group for excluded comments so they are still visible to the user.
- Implementing more options for the users to refine the data and customize it to their situation and needs. For example:
  - The ability to exclude certain posts or words from analysis.
  - Splitting up long posts into sections that can be analyzed separately to avoid the conflicting analysis of longer posts.

Although elements of the toolkit interface and the algorithm could be improved to help users understand the results better, the toolbox worked very well with the longer more in depth posts that are more common to blogs and forums than to social media.

5 Facebook and Twitter Case Study - Social Networks

The intention of this case study was the validation of usefulness of topic opinion analysis of social media for politics. Therefore we designed three use cases how this technology may support politicians' everyday life:

1. **Local Facebook topics**: Within this use case, we monitored a sample of at least ten Facebook pages represent a geographical areas like an MP's constituency. Here topic opinion analysis was applied to extract the topics that people discussed on the pages. Each topic is a combination of words that represents a theme of the discussion, and comes with key users, and key comments.
2. **Monitoring topics on Twitter**: The intention of the second use case is to identify subtopics on Twitter. For instance, the general debate on climate change covers subtopics like green energy, new kinds of technologies. Here we collected data three times a day from Twitter by searching for e.g. "climate change", and used topic analysis to detect the topics of the results. Because the results are already filtered by the search, the analysis produced subtopics.

This case study was conducted with a number of governmental representatives as end-user stakeholders: two members of the German Bundestag, four employees that work directly for a member of the German Bundestag, two members of the State

Parliament North Rhine-Westphalia[4], one small German city (Kempten), one big German city (Cologne), and with a German state chancellery (Saarland). In total this evaluation consisted of 11 questionnaires and 12 semi-structured interviews following the questionnaires. The questionnaires and interviews were based on an individual analysis report that was created from four weeks of data collected from Facebook and Twitter using the toolbox search tools and scheduler.

5.1 Methodology

To address the aims above, we configured the toolbox to collect data relevant to our proposed interviewees – we created user accounts for them, and set up automatic scheduled searches that were relevant to them. This enabled us to demonstrate and evaluate the analysis components with the external users that would contain subject matter they were interested in. Our reasoning behind this was that if they were interested, they would be better engaged, and therefore the quality of feedback would be better than if we had used arbitrary searches. Feedback from previous meetings with end user stakeholders showed us that local or constituency-based searches were of high importance to them, so these were strongly featured in the searches we set up.

- **Strategy**: Our strategy was the preparation of an individual analysis report. Each report was created using the same structure, but with data targeted to the end-user stakeholder it was intended for, and included approx. ten Facebook pages, related to the local area. For Twitter we used approx. five keyword searches using phrases around the end-user stakeholder's areas of interest. The unique data profile was initially created by the WeGov project team and was updated over several iterations by the feedback end users provided concerning their profile. For the collection from Facebook pages, we used the Facebook search tool, where we queried the constituency and the names of cities and towns within the constituency. The pages represent a selection of the available pages related to or managed by cities, public institutions, associations, local associations, arts and culture, politics, tourism and the local press. Pages with more likes, posts and comments were selected before those that displayed less public engagement. If the MP had "liked" one of the selected pages this information was noted.
- **Analysis Report**: After four weeks of data collection, the data was analyzed by the toolbox following the "Social Network" use case pattern described above, and the results were collated into reports. The reports included a description of the evaluation strategy and the results at a glance, on one page where possible, and were sent to end users approx. two weeks before the interviews to allow time for them to prepare their comments and feedback.
- **Questionnaire**: In addition to the analysis report, the participants got a questionnaire that covered concrete examples from the report. All questionnaires contained the following information and included the same questions. The only

[4] URL: `http://en.wikipedia.org/wiki/Landtag_of_North_Rhine-Westphalia` (Retrieved 9/3/13).

difference was the sample of analysis results that were tailored to the target end user, and contained questions similar to the following examples: Is the topic clear? What is the label for this topic? Do you know the topic from presswork? Is this an interesting topic?

- **Follow-up Interviews**: Follow-up interviews were conducted to receive more in-depth assessments about the analysis results, which were provided within the analysis report and the questionnaire. Here the interview focused on the reasons that stakeholders answered the questionnaires in the way that they did.

5.2 Findings

- **Sensible and expected topics:** The toolbox is providing topics that were sensible and expected given the source data. All topics from local Facebook pages that were assessed as understandable were known beforehand. The reasons being: stakeholders are well informed about topics that arise or are discussed within their constituency. Stakeholders follow local social network channels and are part of social network discussions – so they are 'aware of the public area'. Regarding the further twitter analysis results the assessment was often the same: stakeholders monitor topics – therefore they are 'aware of the public area' and which subtopics being discussed. Within the samples that were shown to the interviewees the subtopics were identified and the topic of discussion was clear to them. Therefore the analysis is able to provide the topics that are relevant for the queried search on Twitter; if there are enough tweets.
- **Quality of topics:** When comparing the use cases 'Facebook topics' and 'Twitter topics', the Twitter results were more useful to the stakeholders. For topics like 'federal armed forces' all of the relevant subtopics were identified. Concerning Facebook the topics were better understandable and helpful for the interviewees when they were extracted from Facebook pages with high discussion activity (e.g. Angela Merkel[5] or the press).
- **Different meanings for topics:** All interviewees mentioned that the combination of five words for one topic could have multiple meanings. It is often the case that two or three words fit together and another word has a completely different meaning for the group of words as a whole. Another problem is that single words can also have different meanings. For instance 'dear': one interviewee mentioned that it was not clear to him if this word means the form of address, a verb, an adjective or if it is part of a substantive. Depending on the single meaning of the word the combination with other words can have different meanings.
- **Less clear topics with local Facebook pages:** All interviewees observed that the topics are often unclear for local pages. The reason why 42% of the 110 topics were assessed as understandable topics is due to the fact that policy makers know what's happening in the area of their electorate. The interviewees confirmed that the number of 42% in the questionnaire is a very optimistic number, because the interviewees often made a guess what the meaning of the topic could be. Most of

[5] URL: `https://www.facebook.com/AngelaMerkel` (Retrieved 13/03/2013).

the topics were clear to them, because they know the 'real world' case and can therefore suggest the topic. All interviewees confirmed further that this background information is necessary for most of the provided topics. The interviewees argued that the analysis is only as good as the input data. On the local area there are not so many political debates that are public. But the results with Twitter have shown that the topic analysis is able to provide useful results.

The validation of sentiment analysis was not part of the questionnaire. But the analysis report covered at least one example similar to figure 1 that has been discussed during the expert interviews. Most of the interviewees can guess at the meaning of 'sentiment' and 'controversy' within the toolbox, and can use these indicators to choose a topic, and to read the posts contained within the group. But:

- It's not 'clear' to them why a discussion is either positive or negative as the visualization provides only one scale. For instance it may help to show the total number of both - the number of positive and also the number of negative comments.
- When combined with 'controversy', the 'sentiment' is less clear. End users have difficulties understanding what the discussion looks when only seeing both scales.
- The 'controversy' scale it is easier to understand when viewed separately. In general the UI needs improvement to provide the end users with a better understanding of its parameters.

6 Conclusions

This paper shows two case studies how to apply and validate topic opinion analysis for user comments on the Internet. While the first case study focused on the HeadsUp online discussion forum the second case focused on Facebook local pages and Twitter as social networks. Even if the approaches are different, both case studies follow the same process model and show added value as well as possible boarder-lines.

Both evaluation approaches were very effective with respect to the quality of validation and the end users' feedback. While the HeadsUp case focused on the accuracy and reliability of analysis data the social network case focused on the usability of analysis results to be used within the decision-makers' everyday life. However both cases were very time consuming. For instance the analysis reports and the extracted sample for the questionnaire needed current and personalized data - Facebook pages and topics for Twitter of interest to the stakeholder. Therefore this approach needed research time on the social web and continuous coordination with the end users to design an individual data report. Including all steps that were necessary to run this study, about one week was needed for each end user.

The toolkit returns on average a topic group for every 30 posts (HeadsUp) when the number of topic groups is not set manually by a user. However, the comments will not be distributed equally across the topic groups. Without being able to manually set the number of topic groups returned, the results were very hard to understand. With a medium sized forum of around 300 posts the outcome may be understandable but with smaller or larger forums the topic groups are either not refined enough or there

are so many topic groups that patterns are hard to see or too many similar topic groups are returned. However, it is important to note that the data being tested on the toolkit had already been analyzed manually so there was already an understanding of what the debates were about; discussions that were previously unseen may be more challenging for a user to understand.

In the case of HeadsUp, the toolbox could be helpful in analyzing forum data, particularly the larger forums with hundreds or thousands of comments. The toolkit takes seconds to analyze hundreds of comments, whereas human analysis takes days to see similar results. In the social network case the interviewees argued that the toolbox is a tool that is between them and the large amount of social network data. Therefore the toolbox needs to consider that the behavior of the social network may change frequently – for instance through new privacy settings on Facebook or the way that political parties in Germany, the pirates, have revolutionized discussions on social network using open and transparent methods. However the results were very useful on Twitter to inform on particular topics to see the width of a debate.

The toolbox is best at dealing with large quantities of data, amounts that could not be analyzed effectively by a human without significant resources to do so. The toolkit performs well on relatively in-depth data - this lends itself to blogs and forums that encourage more considered and less immediate responses. The toolbox also performed well in showing the nuances between different elements of a wider debate within the HeadsUp case and the Twitter case. With local Facebook pages the quality of results worsen due to the fact of the quality of input data and less political conversations. Instead of monitoring a bunch of local Facebook pages the interviewees proposed to select less pages, but with more qualitative and more active political debates.

Although the toolbox was primarily conceived of as a project focusing on the analysis of political conversations on social media, it also has applications for forums and blogs. Most websites now support comments and sites such as the BBC or Daily Mail regularly have hundreds of comments on each article.

Civil society groups also run forums and blogs to connect with their members and supporters. Analyzing the themes of these discussions is often beyond the resources these organizations have. The toolbox could play an important role in helping small not-for-profit organizations, larger media organizations, as well as politicians and policy-makers to understand feedback across a range of communication channels.

Acknowledgements. The WeGov project (no. 248512) is funded with support from the European Commission under the SEVENTH FRAMEWORK PROGRAMME THEME ICT 2009.7.3 ICT for Governance and Policy Modelling.

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