

Electronic Government and Electronic Participation

Joint Proceedings of Ongoing Research, Posters, Workshop and Projects of IFIP EGOV 2014 and ePart 2014

Janssen, MFWhA; Bannister, F.E.; Glassey, O; Scholl, H.J.; Tambouris, E; Wimmer, M.A.; Macintosh, A

Publication date

2014

Document Version

Final published version

Citation (APA)

Janssen, MFWhA., Bannister, F. E., Glassey, O., Scholl, H. J., Tambouris, E., Wimmer, M. A., & Macintosh, A. (Eds.) (2014). *Electronic Government and Electronic Participation: Joint Proceedings of Ongoing Research, Posters, Workshop and Projects of IFIP EGOV 2014 and ePart 2014*. (Innovation and the Public Sector; Vol. 21). IOS Press. <http://ebooks.iospress.nl/volume/electronic-government-and-electronic-participation>

Important note

To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

ELECTRONIC GOVERNMENT AND ELECTRONIC PARTICIPATION

Innovation and the Public Sector

The functioning of the public sector gives rise to considerable debate. Not only the efficiency and efficacy of the sector are at stake, but also its legitimacy. At the same time we see that in the public sector all kinds of innovations are taking place. These innovations are not only technological, which enable the redesign of all kinds of processes, like service delivery. The emphasis can also be put on more organizational and conceptual innovations. In this series we will try to understand the nature of a wide variety of innovations taking place in the public sector of the 21st century and try to evaluate their outcomes. How do they take place? What are relevant triggers? And, how are their outcomes being shaped by all kinds of actors and influences? And, do public innovations differ from innovations in the private sector? Moreover we try to assess the actual effects of these innovations, not only from an instrumental point of view, but also from a more institutional point of view. Do these innovations not only contribute to a better functioning of the public sector, but do they also challenge grown practices and vested interests? And what does this imply for the management of public sector innovations?

Series Editors:

Prof. Dr. Victor J.J.M. Bekkers

Erasmus University, Rotterdam, The Netherlands

Prof. Jean Hartley

The University of Warwick, Coventry, United Kingdom

Prof. Sharon S. Dawes

University at Albany/SUNY, Albany, NY, USA

Volume 21

Recently published in this series

- Vol. 20. A. Meijer, F. Bannister and M. Thaens (Eds.), *ICT, Public Administration and Democracy in the Coming Decade*
- Vol. 19. I. Snellen, M. Thaens and W. van de Donk (Eds.), *Public Administration in the Information Age: Revisited*
- Vol. 18. C.W.R. Webster, E. Töpfer, F.R. Klauser and C.D. Raab (Eds.), *Video Surveillance – Practices and Policies in Europe*
- Vol. 17. M. Fenger and V. Bekkers (Eds.), *Beyond Fragmentation and Interconnectivity – Public Governance and the Search for Connective Capacity*
- Vol. 16. A.-V. Anttiroiko, S.J. Bailey and P. Valkama (Eds.), *Innovative Trends in Public Governance in Asia*

This series is a continuation of “Informatization Developments and the Public Sector” (vols. 1–9, ISSN 0928-9038)

ISSN 1871-1073 (print)
ISSN 1879-8454 (online)

Electronic Government and Electronic Participation

Joint Proceedings of Ongoing Research, Posters, Workshop and
Projects of IFIP EGOV 2014 and ePart 2014

Edited by

Marijn F.W.H.A. Janssen

Delft University of Technology, The Netherlands

Frank Bannister

Trinity College Dublin, Ireland

Olivier Glassey

Swiss Graduate School of Public Administration, Switzerland

Hans Jochen Scholl

University of Washington, USA

Efthimios Tambouris

University of Macedonia, Greece

Maria A. Wimmer

University of Koblenz-Landau, Germany

and

Ann Macintosh

University of Leeds, UK

IOS
Press

Amsterdam • Berlin • Tokyo • Washington, DC

© 2014 The Authors and IOS Press.

This book is published online with Open Access by IOS Press and distributed under the terms of the Creative Commons Attribution Non-Commercial License.

ISBN 978-1-61499-428-2 (print)

ISBN 978-1-61499-429-9 (online)

Library of Congress Control Number: 2014946456

Publisher

IOS Press BV

Nieuwe Hemweg 6B

1013 BG Amsterdam

Netherlands

fax: +31 20 687 0019

e-mail: order@iospress.nl

Distributor in the USA and Canada

IOS Press, Inc.

4502 Rachael Manor Drive

Fairfax, VA 22032

USA

fax: +1 703 323 3668

e-mail: iosbooks@iospress.com

Cover Design

Joost van Grinsven

LEGAL NOTICE

The publisher is not responsible for the use which might be made of the following information.

PRINTED IN THE NETHERLANDS

Organization EGOV 2014

Executive Committee

Marijn Janssen, Delft University of Technology, The Netherlands

Maria A. Wimmer, University of Koblenz-Landau, Germany

Hans J. (Jochen) Scholl, University of Washington, USA

Frank Bannister, Trinity College Dublin, Ireland

Chairs PhD Colloquium

Sharon Dawes, Center for Technology in Government, University at Albany, NY/USA

Björn Niehaves, ERCIS, Universität Münster, Germany

Chair of Outstanding Papers Award

Olivier Glassey, IDHEAP, Switzerland

Program Committee

Suha Alawadhi, Kuwait University, Kuwait

Vincenzo Ambriola, University of Pisa, Italy

Kim Andersen, Copenhagen Business School, Denmark

Renata Araujo, Department of Applied Informatics, UNIRIO, Brazil

Karin Axelsson, Linköping University, Sweden

Frank Bannister, Trinity College Dublin, Ireland

Victor Bekkers, Erasmus University, The Netherlands

Lasse Berntzen, Vestfold University College, Norway

John Bertot, University of Maryland, USA

Dana-Maria Boldeanu, Bucharest Academy of Economic Studies/E-CAESAR Centre,
Romania

Laurence Brooks, Brunel University, United Kingdom

Wojciech Cellary, Poznan University of Economics, Poland

Antonio Cerone, United Nations University, China

Bojan Cestnik, Temida d.o.o., Jožef Stefan Institute, Slovenia

Jean-Loup Chappelet, Swiss Graduate School of Public Administration, Switzerland

Yannis Charalabidis, National Technical University Athens, Greece

Wichian Chutimaskul, King Mongkut's University of Technology Thonburi, Thailand

Antonio Cordella, London School of Economics, United Kingdom

Flavio Corradini, University of Camerino, Italy

Ahmed Darwish, Ministry of State of Administrative Development, Egypt

Sharon Dawes, University at Albany/SUNY, USA

Rahul De', Indian Institute of Management Bangalore, India

Yogesh Dwivedi, Swansea University, United Kingdom

Elsa Estevez, United Nations University, China

Enrico Ferro, Istituto Superiore Mario Boella, Italy

Leif Skiftenes Flak, University of Agder, Norway

Sabrina Franceschini, Regione Emilia-Romagna, Italy
 Ivan Futo, Corvinus University of Budapest, Hungary
 Andras Gabor, Corvinno Technology Transfer Center, Nonprofit Public Ltd., Hungary
 Mila Gasco, ESADE, Spain
 Rimantas Gatautis, Kaunas University of Technology, Lithuania
 J. Ramon Gil-Garcia, Centro de Investigación y Docencia Económicas, Mexico
 Olivier Glassey, Swiss Graduate School of Public Administration, Switzerland
 Dimitris Gouscos, University of Athens, Greece
 Helle Zinner Henriksen, Copenhagen Business School, Denmark
 Zahir Irani, Brunel University, United Kingdom
 M. Sirajul Islam, Örebro University, Sweden
 Tomasz Janowski, UNU-IIST Center for Electronic Governance, China
 Arild Jansen, University of Oslo, Norway
 Marijn Janssen, Delft University of Technology, The Netherlands
 Luiz Joia, Brazilian School of Public and Business Administration, Brazil
 Yushim Kim, Arizona State University, USA
 Bram Klievink, Delft University of Technology, The Netherlands
 Ralf Klischewski, German University in Cairo, Egypt
 Helmut Kremer, Technical University Munich, Germany
 Katarina Lindblad-Gidlund, Mid Sweden University, Sweden
 Miriam Lips, Victoria University of Wellington, New Zealand
 Euripidis Loukis, University of the Aegean, Greece
 Luis F. Luna-Reyes, Universidad de las Americas-Puebla, Mexico
 Gregoris Mentzas, National Technical University of Athens, Greece
 Jeremy Millard, Danish Technological Institute, Denmark
 Carl Erik Moe, University of Agder, Norway
 José María Moreno-Jiménez, Universidad de Zaragoza, Spain
 Björn Niehaves, European Research Center for Information Systems, Germany
 Peter Axel Nielsen, Aalborg University, Denmark
 Adegboyega Ojo, Insight @ National University of Ireland, Galway, Ireland
 Theresa Pardo, Center for Technology in Government, University at Albany, USA
 Vassilios Peristeras, European Commission – DIGIT B2, Belgium
 Rimantas Petrauskas, Kazimieras Simonavicius University, Lithuania
 Michael Räckers, European Research Center for Information Systems (ERCIS),
 Germany
 Peter Reichstaedter, Federal Chancellery of Austria, Austria
 Nicolau Reinhard, University of São Paulo, Brazil
 Reinhard Riedl, Bern University of Applied Sciences, Switzerland
 Øystein Sæbø, University of Agder, Norway
 Rodrigo Sandoval, State Autonomous University of Mexico Toluca, Mexico
 Hans J. Scholl, University of Washington, USA
 Margit Scholl, TH Wildau, Germany
 Jamal Shahin, Vrije Universiteit Brussel, Belgium
 Henk Sol, Groningen University, The Netherlands
 Mauricio Solar, Universidad Tecnica Federico Santa Maria, Chile
 Maddalena Sorrentino, University of Milan, Italy
 Witold Staniszkis, Rodan Systems, Poland
 Efthimios Tambouris, University of Macedonia, Greece
 Yao-Hua Tan, Delft University of Technology, The Netherlands

Lidwien Van De Wijngaert, University of Twente, The Netherlands
Mirko Vintar, University of Ljubljana, Slovenia
Jörn Von Lucke, Zeppelin Universität Friedrichshafen, Germany
Vishanth Weerakkody, Brunel University, United Kingdom
Maria Wimmer, Universität Koblenz-Landau, Germany
Petra Wolf, Technical University Munich, Germany
Adam Wyner, University of Aberdeen, United Kingdom
Chien-Chih Yu, National ChengChi University, Taiwan

Additional Reviewers

Gabriel Cavalheiro, Brazilian School of Public and Business Administration, Getulio Vargas Foundation, Brazil
Marcelo Fornazin, Brazilian School of Public and Business Administration, Getulio Vargas Foundation, Brazil
Laura Fortunato, University of Salento, Italy
Yiwei Gong, Nyenrode Business University, The Netherlands
Anton Joha, Whiteline Research and Delft University of Technology, The Netherlands
Devender Maheshwari, Delft University of Technology, The Netherlands
Eleni Panopoulou, University of Macedonia, Greece
Anneke Zuiderwijk, Delft University of Technology, The Netherlands

This page intentionally left blank

Organization ePart 2014

Conference Chairs

Efthimios Tambouris, University of Macedonia, Greece
 Ann Macintosh, The University of Leeds, UK
 Frank Bannister, Trinity College Dublin, Ireland

Chairs PhD Colloquium

Sharon Dawes, Center for Technology in Government, University at Albany, NY/USA
 Björn Niehaves, ERCIS, Universität Münster, Germany

Chair of Outstanding Papers Award

Olivier Glassey, IDHEAP, Switzerland

Program Committee and Reviewers

Steffen Albrecht, Karlsruhe Institute of Technology, Germany
 Joachim Åström, Örebro University, Sweden
 Frank Bannister, Trinity College Dublin, Ireland
 Lasse Berntzen, Vestfold University College, Norway
 Yannis Charalabidis, National Technical University Athens, Greece
 Soon Ae Chun, CUNY, USA
 Todd R. Davies, Stanford University, USA
 Anna De Liddo, KMi, Open University, Milton Keynes, UK
 Annelie Ekelin, Blekinge Institute of Technology, Sweden
 Elsa Estevez, United Nations University, China
 Olivier Glassey, Swiss Graduate School of Public Administration, Switzerland
 Dimitris Gouscos, University of Athens, Greece
 Johann Höchtl, Danube University Krems, Austria
 Naiyi Hsiao, National Chengchi University, Taiwan
 Luiz Joia, Brazilian School of Public and Business Administration, Brazil
 Nikos Karacapilidis, University of Patras, Greece
 Roman Klinger, University of Bielefeld, Germany
 Euripidis Loukis, University of the Aegean, Greece
 Rui Pedro Lourenço, INESC Coimbra, Portugal
 Cristiano Maciel, Universidade Federal de Mato Grosso, Brasil
 Ann Macintosh, University of Leeds, UK
 Rony Medaglia, Copenhagen Business School, Denmark
 Yuri Misnikov, University of Leeds, UK
 Ojelanki Ngwenyama, Ryerson University, Canada
 Adegboyega Ojo, Insight @ National University of Ireland, Galway, Ireland
 Panagiotis Panagiotopoulos, Brunel University, UK
 Theresa Pardo, Center for Technology in Government, University at Albany, USA
 Peter Parycek, Danube University Krems, Austria

Marco Prandini, University of Bologna, Italy
 Andrea Resca, LUISS Guido Carli University, Italy
 Sabrina Scherer, University of Koblenz-Landau, Germany
 Hans J. Scholl, University of Washington, USA
 Toramatsu Shintani, Graduate School of Engineering, Nagoya Institute of Technology,
 Japan
 Mauricio Solar, Universidad Técnica Federico Santa María, Chile
 Øystein Sæbø, University of Agder, Norway
 Efthimios Tambouris, University of Macedonia, Greece
 Konstantinos Tarabanis, University of Macedonia, Greece
 Ella Taylor-Smith, International Teledemocracy Center, UK
 Peter Teufl, Graz University of Technology, Austria
 Daniela Tiscornia, ITTIG-CNR, Italy
 Maria Wimmer, Universität Koblenz-Landau, Germany
 Adam Wyner, University of Aberdeen, United Kingdom
 Chien-Chih Yu, National ChengChi University, Taiwan

Additional Reviewers

Gabriel Cavalheiro, Brazilian School of Public and Business Administration, Getulio
 Vargas Foundation, Brazil
 Marcelo Fornazin, Brazilian School of Public and Business Administration, Getulio
 Vargas Foundation, Brazil
 Eleni Panopoulou, University of Macedonia, Greece
 Lukasz Porwol, Insight @ National University of Ireland, Galway, Ireland
 Ralph Schoellhammer, Danube University Krems, Austria

Preface

Each year, scholars from all over the globe present their research and share their experiences in the fields of e-government, e-participation, and ICT supported policy and governance of state under the umbrella of the two working conferences the International Federation for Information Processing Working Group 8.5 (Information Systems in Public Administration), or short, IFIP WG 8.5, is organizing. Since 2001, IFIP WG 8.5 runs the EGOV (international conferences on Electronic GOVERNment) series of conferences, which has solidly established itself as one of three core conferences in the research domain of e-government, e-governance, and e-participation. Since 2009, ePart, the International Conference on eParticipation, has emerged from the strand of EGOV as a sister conference focusing on the domain of e-participation. Henceforth, EGOV concentrated more on e-government-related topics. The common strands of ICT-enabled public governance, ICT-enabled policy making and public service provision strongly unites these two conferences. Accordingly, the chairs of both conferences maintain close links and are committed to co-locating the two events also in the years to come. Co-location intentionally allows for exchange and cross-fertilization between the two communities.

Papers at IFIP EGOV and ePart shine through scientific credibility and rigor as well as through high relevance to practice. Likewise the keynote speakers come from both practice and academia, which presents a fruitful combination as practice can drive research, and research is needed by practice.

Like its predecessors, IFIP EGOV 2014 and ePart 2014 conferences attracted scholars from around the world as a venue of high reputation. The IFIP EGOV 2014 “Call for Papers” attracted a wide range of topics with 70 submissions, which included 27 accepted full research papers and 27 posters and ongoing research papers. In addition, a workshop about “Critical Success Factors for Open Data – From Policy to Participation and Innovation” was organized. The papers of ongoing research were grouped under the following headers:

- Stakeholders and participation
- Open data and interoperability
- ICT-enabled policy-making
- Services
- Design, architecture and processes
- Evaluation and public values

The IFIP ePart 2014 “Call for Papers” attracted a wide range of topics with 22 submissions, which included 11 accepted full research papers and 5 ongoing research papers. In addition a workshop about “eParticipation for Slum Upgrading in Mtwapa, Kenya” was organized. The papers were grouped under the following headers:

- Social media
- Review and Analysis
- Engaging citizens online

- Software platforms and evaluation
- eConsultations

The Paper Awards Committee of IFIP EGOV and IFIP ePart was again led by committee chair Olivier Glassey of IDHEAP, Lausanne/Switzerland. The organizing Committee carefully reviewed the accepted papers and granted outstanding paper awards to the winning authors. The winners were awarded in the ceremony during the conference dinner, which has become a highlight of each year of conference. The names of the award winners of IFIP EGOV were announced on the conference web page: <http://www.egov-conference.org/egov-conf-history/egov-2014/>. The names of the award winners of IFIP ePart were announced on the conference web page: <http://www.epart-conference.org/>.

Many people make large events like this conference happen. We thank the members of the IFIP EGOV 2014 and IFIP ePart 2014 program committees and the additional reviewers for their great efforts in reviewing the submitted papers. Frank Bannister and his team of Trinity College Dublin, Republic of Ireland were a major contributor who tirelessly organized and managed the zillions of details locally. They hosted the IFIP EGOV and IFIP ePart conferences 2014 on shortest notice and managed everything in time.

The conference was held at the heart of Dublin, the Trinity College with its magnificent buildings and beautiful campus spanning 47 acres. Trinity College Dublin was created by royal charter in 1592. There were 16,646 registered students in 2012/13 and over 100,277 alumni (source: www.tdc.ie). Trinity College has a long history, whose ongoing traditions and enduring artifacts we were able to enjoy. The conference dinner was held in the marvellous 18th century Dining hall. The welcome drinks were held in the Atrium, which has a modern structure and is an obvious contrast to the more traditional Dining Hall.

August/September 2014

Marijn Janssen
 Frank Bannister
 Olivier Glassey
 Hans J. (Jochen) Scholl
 Efthimios Tambouris
 Maria A. Wimmer
 Ann Macintosh

Contents

Organization EGOV 2014	v
Organization ePart 2014	ix
Preface	xi
<i>Marijn Janssen, Frank Bannister, Olivier Glassey, Hans J. (Jochen) Scholl, Efthimios Tambouris, Maria A. Wimmer and Ann Macintosh</i>	
ePart 2014	
Supporting ‘Participation’ in Mobile Participation	3
<i>Titiana-Petra Ertiö and Sampo Ruoppila</i>	
Determinants of the Willingness to Contribute to an eConsultation	13
<i>Alfred Taudes and Hannes Leo</i>	
A Framework for Evaluating the Impact of E-Participation Experiences	20
<i>Cristina Perez Espes, Maria A. Wimmer and José Maria Moreno-Jimenez</i>	
“BiPart” of Participatory Budgeting. A Software Platform for New Political Practices	30
<i>Stefano Stortone and Fiorella De Cindio</i>	
A Semantic Deliberation Model for e-Participation	40
<i>Lukasz Porwol, Adegbajega Ojo and John Breslin</i>	
EGOV 2014	
Stakeholders, Participation and Voting	
Rationality of Internet Voting in Estonia	55
<i>Meelis Kitsing</i>	
Problematizing the Participatory Subject in Demands Driven Development of Public Sector	66
<i>Katarina L. Gidlund and Johanna Sefyrin</i>	
Evaluation of E-Participation in Social Networks: Russian E-Petitions Portal	76
<i>Lyudmila Bershadskaya, Andrei Chugunov and Dmitrii Trutnev</i>	
Stakeholder Involvement in Public e-Service Development – Broadening the Scope of User Involvement	84
<i>Ida Lindgren</i>	
Open Data and Interoperability	
Automatic Generation of Roadmaps for Open Data	95
<i>Mauricio Solar, Fernando Daniels and Roberto Lopez</i>	

Generic Data Models for Semantic e-Government Interoperability: Literature Review	106
<i>Katariina Ryhänen, Tero Päivärinta and Pasi Tyrväinen</i>	
The Effects of Individual Differences on Trust in e-Government Services: An Empirical Evaluation	120
<i>Abdulaziz Albeshar and Laurence Brooks</i>	
How Can ICTs Support Rural Development	130
<i>Arild Jansen</i>	
Design and Adoption of Standard Specifications Using the V-Model	141
<i>Ansgar Mondorf and Maria A. Wimmer</i>	
ICT-Enabled Policy-Making	
A Collaborative Approach to Study Policy Modelling Research and Practice from Different Disciplines	153
<i>Dragana Majstorovic and Maria A. Wimmer</i>	
A Process for Combining Policy Formation with Innovative Design	163
<i>I.T. Hawryszkiewicz</i>	
Fusing Open Public Data, Prosperity Indexes, Fuzzy Cognitive Maps and Argumentation Technology for More Factual, Evidence-Based and Accountable Policy Analysis and Evaluation	175
<i>Ourlana Markaki, Panagiotis Kokkinakos, Sotirios Koussouris, John Psarras, Yuri Glickman and Habin Lee</i>	
Private Financing of Road Taxation	185
<i>Wouter van Haaften and Tom van Engers</i>	
Services	
The Impact of Digitization on the Management of Administrative Procedures: The Case of Building Permits	197
<i>Georgia Kourakou, Olivier Glassey and Florian Evequoz</i>	
Modeling Tools of Service Value Networks to Support Social Innovation in a Smart City	206
<i>Enza Giangreco, Lanfranco Marasso, Valentina Chetta, Laura Fortunato and Cosimo Perlangei</i>	
Administrative and Digital Literacy: The Legend or Myth in e-Government	216
<i>Bojan Cestnik and Alenka Kern</i>	
Design, Architecture and Processes	
Enterprise Architecture in Public ICT Procurement in Finland	227
<i>Juha Lemmetti and Samuli Pekkola</i>	
Semi-Automatic Business Process Modeling for E-Government	237
<i>Eliane Maalouf, Maria Sokhn, Anne Le Calve and Fabian Cretton</i>	

Testing Communicability in Public e-Services – Process and Outcomes <i>Marie-Therese Christiansson and Malin Wik</i>	244
Revisiting the Problem of Technological and Social Determinism: Reflections for Digital Government Scholars <i>J. Ramon Gil-Garcia, Leonardo F. Vivanco and Luis F. Luna-Reyes</i>	254

Evaluation

An Evaluation of the State of Local e-Governance in Bangladesh <i>Mohammad Shahadat Hossain, Tanja Svarre and Pär-Ola Zander</i>	267
The Public Value of Social Media in the UK Public Sector <i>Mohamad W. Osmani, Vishanth Weerakkody, Uthayasankar Sivarajah and Ramzi El-Haddadeh</i>	276
User Experience as a Personalized Evaluation of an Online Information System <i>Margit Scholl</i>	287

Posters

The Project “iBaMs – Barrier-Reduced Machines in Innovative Interaction” <i>Margit Scholl</i>	299
--	-----

Workshops

Workshop on Critical Success Factors for Open Data – From Policy to Participation and Innovation <i>Iryna Sussha, Anneke Zuiderwijk, Marijn Janssen, Peter Parycek and Euripidis Loukis</i>	305
Workshop: eParticipation for Slum Upgrading in Mtwapa, Kenya <i>Claudio Torres, Fabienne Perucca and Joshua Mulandi</i>	307
Subject Index	309
Author Index	311

This page intentionally left blank

ePart 2014

This page intentionally left blank

Supporting ‘Participation’ in Mobile Participation

Titiana-Petra ERTIÖ¹ and Sampo RUOPPILA
University of Turku, Department of Social Research

Abstract. Mobile participation has been studied, so far, mostly from the perspective of emphasising human interaction with technology. The research question of our paper is, instead, how to support the ‘participation’ in mobile participation. We tackle this question by reviewing literature on inclusive participation and motivation in general, and discussing the significance for mobile participation. We begin the review with inclusiveness challenges of technology-mediated participation, followed by theories on motivation to participate and requirements of participation practices, and finally give our account of three ways in which mobile participation is already transforming the realm of participation. We conclude with concrete advice for those who seek to develop or implement mobile participation practices for citizen engagement.

Keywords. electronic participation, mobile participation, participation practices, application development, participation support

Introduction

Throughout the world, interest has grown in strengthening citizen participation in local governance, especially in urban planning. Citizens’ local knowledge is considered essential information that can contribute to the quality of policies [1]. Digitalisation provides opportunities to engage broader ranges of citizens, offering them tools to participate without the need to attend meetings at particular times. In planning, electronic participation has involved map-based web applications to collect citizens’ knowledge and pin it into geographic coordinates for professional planners to take into account. Recently, ‘mobile participation’, or electronic participation implemented on mobile devices as specific applications (apps) or mobile optimized web pages, has also

¹ Corresponding Author: Titiana-Petra Ertiö, University of Turku, Department of Social Research, Assistentinkatu 7, 20014 Turku, Finland
E-mail addresses: titiana.ertio@utu.fi, sampo.ruoppila@utu.fi

emerged [2]. One new advantage is that mobile participation enables 'situating' engagement in the locations on which the participants are supposed to reflect [3]. This is particularly valuable for urban planning, because planners are interested in people's perceptions of change in particular places. Another advantage is that mobile participation is expected to hold the potential to broaden considerably the number of participants, even from less affluent neighbourhoods [4].

Mobile participation has been studied, so far, mostly from the human-computer interaction perspective (HCI), emphasising interaction with technology [3,5,6]. The research question of our paper is, instead, how to support the 'participation' in mobile participation. We tackle this question by reviewing literature on inclusive participation and motivation in general, and discussing the significance for mobile participation. We begin the review with inclusiveness challenges of technology-mediated participation, followed by theories on motivation to participate and requirements of participation practices, and finally give our account of three ways in which mobile participation is already transforming the realm of participation. We conclude with concrete advice for those who seek to develop or implement mobile participation practices for citizen engagement.

1. Inclusiveness

Inclusiveness has been a major concern in debates on technology-mediated participation. The idea of inequality of technological opportunity is commonly termed the 'digital divide'. The underlying assumption has been that Internet usage is associated with individual benefits, which non-users miss [7]. Early research on the digital divide focused extensively on material and technical access to the Internet and on its connections with socio-economic factors such as income, age, and education. After Internet use has expanded and become part of everyday life for most citizens, the focus of digital divide research has shifted to discuss the differentiation of skills, competencies, and actual usage.

In his seminal book, van Dijk [8] argued that there are differences in four successive and cumulative kinds of access to digital technologies: motivational, material, skills, and usage. Motivational access refers to the wish to use a device and the Internet for a particular matter. Material access refers to physical access to the devices, as well as connections to the Internet (broadband, mobile plan, etc.). Skills access refers to the necessary digital skills to use the hardware and the software. Usage access refers to the actual use of digital media – the ultimate goal of appropriation of technology. Van Dijk makes a crucial point that, regardless of the employed technology, the most significant issue is the motivation to use it. Hence, the first divide is between the 'want' and 'want-not', and only after that between the material 'have' and 'have-nots' – a point that had been greatly neglected by the time of publishing. Moreover, the motivation matters regardless of the material access. This is not to say that the material access does not matter; the better-off have been traditionally better connected to the Internet when compared to the less advantaged. At the turn of the millennium, German and American surveys showed that the major causes for the lack of interest in the Internet were no perceived need, time-consumption or liking, computer anxiety and technophobia, lack of money, and lack of skills [9]. As material access has become common, the differences in skills in how to use the Internet have

gained more attention [10,11]. Skills, however, may also differ among the user groups. For instance, according to van Deursen and colleagues [7], young users possess good operational skills, while older people have the skills to navigate the structure of the Internet. The motivation, technology, and skills are necessary conditions for actual use, but at the stage of usage access, 'want', 'have', and 'can' need to overlap with 'do' – which often means familiarity with using the technology for a particular purpose. Van Dijk [9] argues the model to be recursive in the sense that technological innovations trigger either parts or the whole of the process again.

Recent digital divide research has devoted increasing attention to digital skills and usage – how and why different social groups use the Internet differently, and what it means in an increasingly digital society. In a recent study, van Deursen & van Dijk [11] separated seven clusters of Internet usage: finding information, reading news, personal development, social interaction, leisure, commercial transaction, and gaming. They found that differences in usage exist and that those with higher social status use the Internet in more beneficial ways. These are participation in 'serious' Internet activities, while others only use the Internet for everyday life and entertainment activities. These findings suggest that Internet usage increasingly reflects traditional media usage in society. They also indicate challenges in developing inclusive online participation, including in the mobile context.

2. Motivation and Social Norms

Because the crucial matter is how to motivate individuals to use ICT tools for "serious activities", such as participating in urban governance, we must look at what motivation is about. Psychological studies on motivation classically distinguish between intrinsic and extrinsic types of motivation. Self-determination theory (SDT; [12,13]) posits that individuals are intrinsically motivated to initiate action when it satisfies their innate needs for competence (desire to control the outcome), autonomy (experience of agency for their action), and relatedness (compliance with social norms). Motivation is considered extrinsic when it has an external locus of control [14]. A typical example is monetary incentives, by which desired outcomes are rewarded. Nevertheless, extrinsic motivators may also be immaterial, such as status or reputation. People can assimilate and internalise external motivations (such as future career opportunities or reputation) so that they become self-regulated rather than externally imposed [12,13]. At times, however, extrinsic motivators may weaken and even displace intrinsic motivations, known as 'crowding-out' [15]. Monetary compensation can also undermine agency and interest in the action, because individuals who are paid to contribute have less autonomy in choosing what they want to do. Motivation can be boosted through competence-enhancing feedback, because people tend to enjoy doing what they think they are good at [16].

As to requirements of developing mobile participation, users of technology will likely engage with an application if it appeals to their needs or ambitions, such as having a say in determining planning goals or choosing between development alternatives, for instance. It becomes important, then, to secure feedback to keep up the motivation. Avoiding crowding-out is important; external motivation triggers (incentives and rewards) need to complement internal motivation, not displace it. During task performance, feedback that develops the ideas gives impetus to continue

working on the task. Likewise, controlling feedback might decrease the interest in participating on a voluntary basis. In a recent mobile participation prototype study, Gonçalves et al. [5] found the perceived agency and capacity to achieve ends to effectively motivate citizens to participate.

Rational choice theory predicates that individuals participate because of self-centred motives, to increase their personal gains, emphasising short-term over long-term profit [17]. Yet this assumption quickly creates a social dilemma for cooperation. One mechanism to enable cooperation is through authority. However, contemporary approaches acknowledge that dealing with multiple stakeholders requires alternative strategies, such as seeking complementarities [18] or incentives [19,20].

One thing worth considering when developing mobile participation is that incentives are means to structure collaboration. At times, non-monetary incentives, such as reputation, may be valued more than monetary ones. An empirical study of apps contests has reported that showcasing skills and gaining reputation among peers are valued more than money [21]. Individuals employ complex strategies to collaborate (even over considerable periods of time) to achieve commonly negotiated goals or increase their well-being. Therefore, incentives must be understood in context and their influence on behaviour must not be taken for granted.

Collective action depends on three relationships: reciprocity, trust, and reputation [20]. Reciprocity is considered to be a major factor in enabling effective collaboration; it stems from two complementary theoretical strands, from sociological discussion on the norm of obligation [18] and from game theory, specifically tit-for-tat strategy, postulating that an individual will first collaborate and afterwards replicate their partner's behaviour [22]. Trust is important for collaboration because it reduces complexity and transaction costs quicker than any other form of organisation [20], but it requires time and effort to build. Ostrom [20] asserts that a reputation of trustworthiness is critical to collaboration. Reputation is based on previous courses of action [23] as much as on projected expectations of future behaviour [24].

Participation is also influenced by social norms, which develop in communities over time. Most behaviour is closely embedded in networks of interpersonal relations [25]. People are highly sensitive to other people's perceptions about themselves. As monitoring by peers increases, so does the likelihood of norm-compliant behaviour [26]. Monitoring is influential, because compliance with social norms is shaped by whether individual behaviour is publicly visible or not [27]. The position of an individual in local networks affects their level of community attachment [28]. Weak ties to community present greater opportunities for individuals to engage in matters of public interest, because sporadically knowing people from different circles provides new information. In contrast, strong ties lead to recruitment into small cliques [28]. Besides position, the size of the community influences behaviour in terms of enforcement, monitoring, or social control. Norms are enforced through shaming, peer pressure, or compliance [29].

In developing mobile participation from social norms perspective, it is beneficial to enable users to communicate and build social ties among each other and evolve over time into a community, even a fluctuating one, with varying degrees of attachment. Yet monitoring, as well as feedback, needs to be implemented within the application to ensure the community's formation and sustainability.

3. Participation Practices and Mobile Opportunities

Under the rational-comprehensive planning tradition, motivating citizen participation was not a primary concern. Faced with pressure to solicit citizen input, planners have been more concerned with designing and implementing participatory methods than with motivating citizens to participate. In doing so, they have focussed on the participation *process*. Citizens on the other hand, are interested in the *outcomes* of the participatory process, such as the ability to influence plans [30].

Lowndes et al. [31] provide a thorough analysis of participation requirements, a CLEAR model, which underlines government's duties to support citizens' capability, motivation, and influence. They argue that participation is most effective where citizens:

- Can do: have the resources and knowledge to participate;
- Like to: have a sense of attachment that reinforces participation;
- are Enabled to: are provided with the opportunity for participation;
- are Asked to: are mobilised through public agencies and civic channels;
- are Responded to: see evidence that their views have been considered.

Factors identified by CLEAR model	Apps development	Users' skills	Communications	Involvement in policy making
Can do	User-friendliness	Capacity building	Awareness raising	Explain the task
Like to	Micro-tasks, community building, easiness	Co-operation between users	Feedback	Promotion of trust (that the input will be considered)
are Enabled to	Access to technology	Encouragement of purposeful usage	Invitation, engagement	Commitment of the agency
are Asked to	Promotion of trying	-	Multi-channel communications	Communication of the goals
are Responded to	Feedback functions	-	Feedback	Communication of the impacts on policy

Table 1. How the requirements of the CLEAR model (Lowndes et al. 2006) should be addressed in developing mobile participation.

This is an excellent checklist for developing any participation practice, mobile participation included. The systemic approach is important: in addition to developing the technology of participation (i.e. making an app), these requirements necessitate addressing users' (participants') usage skills, communicating goals and results, and supporting involvement in the policy process (Table 1). For instance, 'Can do' requires the app to be user-friendly and contain comprehensible tasks, but in the light of the theories reviewed, it also requires user skills development, awareness raising, and explaining what the task is about and how it connects with the policy process. 'Like to' requires an application to support a feeling of 'community' among users, through repeated task assignments and feedback from policy-makers, promoting trust that the input will be considered. At their best, community building and trust require constant dialogue among citizens, as well as between them and the government. 'Are enabled to' requires access to the technology, users' skills in participating – to seize the

opportunity to voice ideas and concerns – but also the policy-makers' commitment to consider them. 'Are asked to' requires, first and foremost, multi-channel communications on goals and sought input, to mobilise the maximum number of citizens to participate. However, the application itself can also attract attention from those eager to experiment with new tools or play with possible game elements. 'Are responded to' requires feedback from policy-makers employing participation. As a single factor, 'are responded to' has perhaps the most potential to further boost participation, because it rewards the time and effort of those who contribute. Hence, when developing mobile participation, in addition to developing an app, it is important to communicate the goals, enhance users' skills, support involvement in the policy process, give feedback on input, and communicate the outcome of the policy process.

Existing online participation tools for spatial planning comprise various map-based web applications for facilitating citizen input. Public Participation Geographic Information Systems (PPGIS) have been developed since the late 1990s [32]. The main idea of these tools has been to collect citizens' knowledge, which is pinned into geographic coordinates (on a map) to be visualised and tailored to the planning purpose. Citizens have been typically asked to identify the perceived location of spatial attributes such as landscape values, activities and experiences, development preferences, and special places [32]. Most of the practices have been organised as one-way methods of acquiring knowledge from citizens for research and planning purposes.

GIS-based solutions have been criticised for being difficult for non-experts to use, and not accessible for civil society initiatives [33]. An alternative has emerged in the form of mash-ups, meaning websites that combine data and services from across the web into a single integrated application, usually with Google Maps [33,34]. Following the principles of Web 2.0, mash-ups are created on the basis of information sharing and collaboration, including two-way interaction among participants. Prototypes using such mash-ups for spatial planning have been developed both on the web [34] and on mobile devices.

In this context, mobile participation has emerged only in the 2010s as a phenomenon, and available planning-related apps are still few [2].² So far, studies have given two different meanings for "mobile" in a participation context. Firstly, participating with portable devices (especially mobile phones) that people tend to carry with them and that can thus be used whenever and wherever "on the go" [5,35]. Secondly, "situated engagement" [3], referring to participating with these devices in those locations on which the participants are supposed to reflect. Both are considered new features compared to participating with a desktop computer, which has been the case with most previous forms of e-participation. In this paper, we refer, by mobile participation, to both those types of engaging.

The existing apps mainly cater for information dissemination from government to people. Some apps have features enabling users to report maintenance needs. Although smart phones are equipped with many interactive features, real participatory planning apps supporting dialogue are rare [2].

However, we can already identify at least three ways in which mobile applications are gradually transforming the realm of participation. These are the collection of sensor

² Already before the introduction of smart phones, cell phones were used in transactional operations, such as SMS-based payments or requesting information. However, such use has been technical in character, aimed at automating processes, lacking interactive features for people soliciting their views. To the best of our knowledge, the only SMS-based participatory planning service, Textizen [2], was launched in 2012.

data on the topic of interest as a new form of participation, situated engagement, and the employment of game mechanisms to keep users engaged.

Firstly, while former offline and online participation tools have leaned on citizens' perceived information on the location of certain spatial attributes, mobile participation also enables data collection through sensors built into the device. The location information based on GPS is essential; users don't need to pinpoint their location anymore themselves, because the GPS function can retrieve the phone's geographical location. There are also applications that use the smart phones' accelerometer and microphone. On the basis of volunteering and user permission, this enables the collection of sensor data on the topic of perceived interest, as a new form of public participation. Sensor data collection has been implemented to follow cyclists' itineraries for the sake of traffic planning (an app called CycleTracks used in San Francisco), to identify the location of potholes for street maintenance (StreetBump used in Boston), and to collect alternative databases for noise pollution (WideNoise).

Secondly, mobile participation enables 'situating' engagement for those locations on which the participants are supposed to reflect. Especially the use of mobile phones, which people carry with them all the time, offers new possibilities for inviting the participation of those (registered users) who happen to be nearby. While many former participation practices have sought to involve mainly nearby residents, this approach enables the better integration of engagement activities with all kinds of places that are personally meaningful and relevant to participants [3]. The approach also enables participation in different roles. For instance, if a new bicycle lane was planned on a crossroads, and people on-the-move were consulted through mobile participation, they could choose whether their point of view was that of the car driver, cyclist, or pedestrian. Being present in the place (in-situ), physically close to the planning object (or other subject of participation), is likely to result in richer and more detailed observations than ex-situ (remote) participation. Nonetheless, Bohøj et al. [36] and Korn [3] suggest complementing it with ex-situ participation, in order to increase reflection and understanding through discussions with other participants.

According to our knowledge, there is not yet such an app on the market that would fulfil the idea of situated engagement. However, ideas have been tested in several prototypes [6,35,36,37], which have employed elements such as map views, discussion topics with voting systems, geo-tagged multimedia upload possibilities, location-based annotations, and shared tags. In addition, one much-expected future advantage is applying augmented reality for visualising proposed developments. 3D models of proposed developments shown on the screen, as if they were already part of the landscape, will make commenting on plans much easier for non-professionals [38].

Thirdly, following practices in social media, the mobile applications are bringing game mechanisms to the field of participation as a tool to increase or keep up engagement. In addition to other motivational factors, games add "collaboration, competition, reward, and fun" to the service, thus increasing user retention and participation [39]. Participation takes time and effort, and users want to experience agency, which the game mechanisms can help to achieve, while the feedback from the task itself can be slow. Game mechanics are operationalised through points, leader boards, and badges that are usually awarded to top contributors. However, to motivate as many people as possible, 'the top' can be manipulated with a multi-tiered ranking system such as 'Top of worlds' by Kawasaki et al. [40].

4. Conclusions

Mobile participation is a new chapter in the series of developing participation practices in urban governance. It is still in its infancy, but due to its ease of use and comfort, it holds the potential to broaden considerably the number of participants. However, it involves the risk of being challenged by all the general issues of the former participation methods (e.g. lack of feedback) and losing the interactive potential that the mobile phone and its wide usage in social media offer.

Mobile participation has been studied, so far, mostly from the human-computer interaction perspective (HCI), emphasising interaction with technology. Our research question has been, instead, how to support the 'participation' in mobile participation. We have discussed, in this order, inclusiveness challenges of technology-mediated participation, theories on motivation to participate, and requirements of participation practices. We have also accounted for three ways in which mobile participation is already transforming the realm of participation.

Starting with the question of inclusion, we have reported how digital divide research has already moved a long way from 'one of the most confusing myths' that people are either in or out of the digitalising society [9]. There are, rather, differences in several successive and cumulative kinds of access to digital technologies: motivational, material, skills, and usage – a ladder that is recursively climbed after each major innovation [9]. Recently, research has devoted increasing attention to differences in digital skills and Internet usage. Those with higher social status use the Internet more for serious activities [11]. This indicates challenges in developing inclusive mobile participation: how to motivate people to use their devices for engaging with governance issues.

Different theories on motivation give a number of good insights into how to develop successful mobile participation practices. For instance, users will likely engage with an application if it appeals to their needs or ambitions. Participation is driven by both intrinsic and extrinsic types of motivation, ideally so that internal motivation is only complemented by external triggers such as incentives. Participants will likely be seeking shared interests, so it is beneficial to enable them to communicate with each other and evolve into a community. Collaboration can be structured through incentives, monitoring enforcing social norms, and feedback. The importance of feedback is emphasised to keep up motivation and support continuing work on a task. These are concrete ideas to build within an app, as well as an overall participating system.

The systemic factors have been addressed thoroughly in research, tracing the best practices of traditional participation initiatives. A conclusion, based on our discussion of the CLEAR model [31], is that a well-organised process needs to reach much beyond developing a technology for collecting the citizens' input. In addition, it must also address inclusiveness of the policy process, communications, and participants' skills in using the technology. Hence, anyone seeking to successfully implement mobile participation will also have to address these traditional participation concerns.

Meanwhile, the novel forms in which mobile participation is already changing ideas of today's and tomorrow's participation include enabling sensor data collection on a topic of perceived interest as a new form of participation, situated engagement, and the employment of game mechanisms to keep users engaged.

Based on our research, we can give concrete advice for those interested in developing or implementing mobile participation. Of these points of advice, the first

three focus on mobile participation, numbers 4 and 5 on electronic participation in general, and numbers 6 and 7 on two traditional challenges of any participation practice.

1. *Expand usage.* Mobile phones are ubiquitous and smart phones very common, but their usage – what their features enable compared to what they are actually used for – is not as good as it might be. Encourage users to learn new skills and expand “serious” usage [11]. Motivate usage by highlighting the added value of mobile participation, including asynchronous communication, ease of use, and the possibility to reflect on the site.

2. *Situate the engagement.* Use the possibilities of mobile participation to reflect on the site [3].

3. *Utilise sensor data.* Collect and group geo-referenced data captured by the phone’s inbuilt sensors. Feed sensor data into back-office systems and ensure their interoperability. Give users opt-ins to allow data collection in a transparent way.

4. *Make participation fun and easy.* Make the experience game-like and let users achieve gratifying effects [39]. Help counter procrastination by designing micro-tasks that can be easily executed on a small screen, in a very short time. Enable connection with social media.

5. *Build a community.* Enable users to communicate or interact among themselves. Enable liking and commenting on other people’s input [36].

6. *Listen and respond.* Encourage two-way communication between officials and citizens, and provide enhancing feedback. See the current dialogue as a springboard for future engagement [31].

7. *Connect to the policy process.* Safeguard the status of citizens’ contributions to the decision-making process. Require frequent feedback from the policy-makers employing the participation [31].

References

- [1] Michels, A. (2011). Innovations in democratic governance: how does citizen participation contribute to a better democracy? *International Review of Administrative Sciences*, 77, 275-293.
- [2] Ertiö, T. (2013). M-participation: The emergence of participatory planning applications. *Turku Urban Research Programme's Research Briefings* 6b/2013. 9 pp.
- [3] Korn, M. (2013). Situating engagement: Ubiquitous infrastructures for in-situ civic engagement. PhD thesis, Aarhus University. <http://pure.au.dk/portal/files/56904964/phd2013.pdf> (Accessed 18.2.2014).
- [4] Clark, B. Y., Brudney, J. L., Jang, S. G. (2013) Coproduction of government services and the new information technology: investigating the distributional biases. *Public Administration Review*, 73, 687-701.
- [5] Gonçalves, J., Kostakos, V., Karapanos, E., Barreto, M., Camacho, T., Tomasic, A. & Zimmerman, J. (2013). Citizen Motivation on the Go: The Role of Psychological Empowerment. *Interacting with Computers*, Advance Access published July 3, 2013.
- [6] Konomi, S., Sasao, T., Arikawa, M. & Fujita, H. (2013). A mobile phone-based exploratory citizen sensing environment. Paper presented at *UbiComp '13*, September 8–12, 2013, Zurich, Switzerland.
- [7] van Deursen, A., van Dijk, J. & Peters, O. (2011). Rethinking Internet skills: The contribution of gender, age, education, Internet experience, and hours online to medium- and content-related Internet skills. *Poetics*, 39, 125-144.
- [8] van Dijk, J. (2005). *The Deepening Divide. Inequality in the Information Society*. London: Sage Publications.
- [9] van Dijk, J. (2006). Digital divide research: achievements and shortcomings. *Poetics*, 34, 221-235.
- [10] Hargittai, E. (2002). Second-level digital divide: Differences in people's online skills. *First Monday*, 7.
- [11] van Deursen, A. & van Dijk, J. (2013). The digital divide shifts to differences in usage. *New Media & Society*, doi: 10.1177/1461444813487959
- [12] Deci, E. L. & Ryan, R.M. (1987). The support of autonomy and the control of behavior. *Journal of Personality and Social Psychology*, 53, 1024-1037.

- [13] Deci, E. L. & Ryan, R.M. (2000). The "what" and "why" of goal pursuits: human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227-268.
- [14] Johns, G. (1996). *Organizational Behavior: Understanding and Managing Life at Work*, 4th ed. New York: HarperCollins.
- [15] Osterloh, M. & Frey, B. (2000). Motivation, knowledge transfer, and organizational forms. *Organization Science*, 11, 538-550.
- [16] Sansone, C. (1986). A question of competence: the effects of competence on task feedback on intrinsic interest. *Journal of Personality and Social Psychology*, 51, 918-931.
- [17] Frederick, S., Loewenstein, G. & O'Donoghue, T. (2002). Time discounting and time preference: a critical review. *Journal of Economic Literature*, 40, 351-401.
- [18] Powell, W. (1990). Neither market nor hierarchy: Network forms of organization. In Staw, B. & Cummings, L. (Eds.) *Research in Organizational Behavior*, 12, 295-336.
- [19] Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- [20] Ostrom, E. (1998). A behavioral approach to the rational choice theory of collective action, presidential address. *The American Political Science Review*, 92, 1-22.
- [21] Desouza, K. (2012). Challenge.gov: Using Competitions and Awards to Spur Innovation, *IBM Center for the Business of Government*. <http://www.businessofgovernment.org/article/challengegov-using-competitions-and-awards-spur-innovation> (Accessed 19.04.2014)
- [22] Axelrod, R. (1984). *The evolution of cooperation*. Princeton, NJ: Princeton University Press.
- [23] Luoma-aho, V. (2007). Neutral reputation and public sector organizations. *Corporate Reputation Review*, 10, 124-143.
- [24] Sztompka, P. (2000). *Trust: A Sociological Theory*. Cambridge: Cambridge University Press.
- [25] Granovetter, M. (1985). Economic action and social structure: the problem of embeddedness. *American Journal of Sociology*, 91, 481-510.
- [26] Posner, R. & Rasmusen, E. (1999). Creating and enforcing norms, with special reference to sanctions. *International Review of Law and Economics*, 19, 369-382.
- [27] Whatley, M. A., Webster, J. M., Smith, R. H., & Rhodes, A. (1999). The effect of a favor on public and private compliance: How internalized is the norm of reciprocity. *Basic and Applied Social Psychology*, 2, 251-259.
- [28] Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78, 1360-1380.
- [29] Kandori, M. (1992). Social norms and community enforcement. *Review of Economic Studies*, 59, 63-80.
- [30] Brown, G. & Chin, S. (2013) Assessing the effectiveness of public participation in neighborhood planning. *Planning Practice & Research*, 28, 563-588.
- [31] Lowndes, V., Pratchett, L. & Stoker, G. (2006). Diagnosing and remedying the failings of official participation schemes: The CLEAR framework. *Social Policy and Society*, 5, 281-291.
- [32] Brown, G. (2012). Public participation GIS (PPGIS) for regional and environmental planning: Reflections on a decade of empirical research. *URISA Journal*, 25, 5-18.
- [33] Miller, C.C. (2006). A beast in the field: the Google Maps mashup as GIS/2. *Cartographica*, 41, 187-199.
- [34] Nuojua J. (2010). WebMapMedia: a map-based Web application for facilitating participation in spatial planning. *Multimedia Systems*, 16, 3-21.
- [35] Jones, P., Layard A., Speed, C. and Lorne, C. (2013). MapLocal: use of smartphones for crowdsourced planning. Paper presented in 'Using ICT, Social Media and Mobile Technologies to Foster Self-Organisation in Urban and Neighbourhood Governance', May 16-17, 2013, Delft, the Netherlands.
- [36] Bohøj, M., Borchorst, N., Bødker, S., Korn, M. & Zander, P-O. (2011) Public deliberation in municipal planning: supporting action and reflection with mobile technology. *Proceedings of the Communities & Technology conference*, Brisbane, Australia, 88-97.
- [37] Korn, M. & Bødker, S. (2012). Looking ahead – How field trials can work in iterative and exploratory design of ubicomp systems. Paper presented at *UbiComp '12*, Sep 5 – Sep 8, 2012, Pittsburgh, USA.
- [38] Olsson T.D., Savisalo A.T., Hakkarainen, M. and Woodward, C. (2012). User evaluation of mobile augmented reality in architectural planning. In: Gudnason & Scherer (eds.) *eWork and eBusiness in Architecture, Engineering and Construction: ECPPM 2012*. London: Taylor & Francis, 733-740.
- [39] Poplin, A. (2012). Playful public participation in urban planning: A case study for online serious games. *Computers, Environment and Urban Systems*, 36, 195-206.
- [40] Kawasaki, H., Yamamoto, A., Kurasawa, H., Sato, H., Nakamura, M. & Kakinuma, R. (2013). An evaluation of method for encouraging participation. *UbiComp '13 Adjunct Proceedings of the 2013 ACM conference on Pervasive and ubiquitous computing adjunct publication*.

Determinants of the Willingness to Contribute to an eConsultation

Alfred TAUDES^{a,1} and Hannes LEO^b

^a*Vienna University of Economics and Business*

^b*Community-based Innovation Systems GmbH*

Abstract. We report first results of a joint research project of Vienna University of Economics and Business and Cbase GmbH on the design and impact of eConsultations. Using real-world data collected via the cbased platform it is found that one can expect to obtain 11 votes and 1 comment per participant and 1,6 votes per paragraph discussed. In the case of a private eConsultation one can additionally expect 0,6 comments per paragraph. We then discuss the implications of these findings for system design and give an overview over the planned next steps in the project.

Keywords. eConsultation, participation, document discussion

Introduction

“How many people will take part?” and “How many votes and comments can we expect?” are questions a potential client for an eConsultation project often asks. With good reason, as these parameters form the basis for other quality metrics like reciprocity (intensity of dialogue) or external impact. Ideally, one would like to have a spreadsheet implementation of a formula, where characteristics of the project setting (e.g. size and composition of the community, scope, topic etc.) are entered and a range of plausible values for comments and votes to expect are the output.

However, to the best of our knowledge, literature has not matured to this level, yet. A number of works develop evaluation frameworks and apply them to projects (see, e.g., Ferroa et al. [2], Janssen, Kies [9], Kies, Wojcik [11], Macintosh, Smith [16], Smith et al.[19]). Loukis, Wimmer [15] compare two different system designs using two pilot studies and find that less structured alternatives are preferable for public projects with wide audience. Panopoulou et al. [17] derive success factors from a survey among managers of eConsultation projects. Byoungju [1] finds a large variance among the number of comments of 32 eConsultations conducted by the British Parliament, and then compares two projects to infer the importance of publicity and MP involvement. Lee, Kim [12–14] employ the Technology Acceptance Model to empirically measure the strength of factors influencing the propensity to participate in eConsultations. They find out that perceptions of government transparency and of influencing government decision making and trust stimulate the willingness to contribute, same as the strength of the online social network and volunteer activities.

¹ Vienna University of Economics and Business, Institute for Production Management, Welthandelsstrasse 1, 1020 Wien, Austria, E-mail: alfred.taudes@wu.ac.at.

We want to look into this issue by comparing the results of a number of eConsultations conducted on the basis of www.cbased.com. The cbased platform not only supports public legislative projects but any type of document-based collective decision making via a three-step process. In the first step, a document is automatically transformed into a discussion forum. In the second step comments and votes are collected on the paragraph level. There is no obligation to vote or comment on each paragraph. No vote on a comment is interpreted as “no objection”, while a positive vote is interpreted as “I really want this paragraph to remain as it is now”. In the third step a consensus algorithm proposes consensus enhancing document changes based on the votes gathered (see Taudes [20] for further details).

In Section 1 we provide an overview over the eConsultations under consideration. In Section 2 we describe the results of an analysis of covariance of the number of votes and comments collected. The implications of these findings for system design and project management are the topic of Section 3. In the concluding Section 4 we discuss the limitations of this study and give an overview over the planned next steps in the project.

1. Overview over the eConsultations Studied

The public eConsultations considered in this work are summarized in Table 1. A short description of the respective project is given, and for each consultation the size of the document discussed (number of paragraphs), the number of participants (users) and the number of votes and comments collected are listed. The consultations described in Table 1 were open to the general public and everyone with a valid mail address could take part. Dedicated web sites were set up on the basis of the cbased platform (see [4–8]) and awareness campaigns targeted at the particular stakeholder group envisioned were conducted to promote participation.

Table 2 contains the results of the private eConsultations in the survey. Most of these projects were conducted using the standard cbased web design and invitation mails to a predefined group of participants were the only means to create awareness. For an example see <http://www.cbased.com/de/consultation/cluster-manifesto>.

Table 1. Public eConsultations

Project	Users	Paragraphs	Votes	Comments	Description
EU Youth Expectations	217	51	2431	190	Young people throughout Europe were invited to discuss their expectations for the future.
Research Infrastructure	155	64	1500	212	Austrian researchers discussed improvements of the usage and development of infrastructure.
Energy Research Strategy	750	192	8000	806	Austrian researchers discussed the Energy Research Strategy.
Austrian Research Strategy	411	269	6828	713	Austrian researchers discussed the draft Research Strategy 2020 of the Austrian Council.
Austrian National ICT Strategy	67	729	1231	151	The strategy paper to Austria’s ICT Strategy 2013–2018 was publicly discussed.

Table 2. Private eConsultations

Project	Users	Paragraphs	Votes	Comments	Description
EU Cluster Manifesto	111	19	500	171	DG Enterprise and Industry discussed a cluster policy document with cluster managers.
Concept IS Master Program	34	29	43	15	The curriculum of the WU master program on Information Systems was discussed with members of the Austrian Computer Society and the Austrian Computer Users Society.
Postdoc Career Development	48	30	543	159	A concept for career promoting measures for post-doc assistants was consulted with the WU Wien faculty.
Rating Agencies	71	32	293	76	An affiliation of an Austrian political party discussed a policy paper on rating agencies with its members and selected experts.
WU Journal Rating	111	55	889	70	Alternative concepts for a journal ranking systems used to measure scientific output were discussed by the WU Wien faculty.
NPO Governance Codex	39	197	1205	125	A NPO Governance Code was discussed with stakeholders in Austrian non-profit organizations.
Political Program	303	200	4039	328	Members of a subsidiary of an Austrian political party discussed the program.
Organizational Handbook	23	476	1211	378	Voting observers discussed a handbook about new voting technologies worldwide.

2. The Model

2.1. Exploratory Data Analysis

Tables 3 and 4 contain descriptive statistics of the eConsultations under study. As to be expected public eConsultations were larger in all dimensions measured. While the mean numbers of users, votes and comments were about three times higher for public eConsultations the average document consulted in public was about twice as large as the average privately discussed document. Except for the number of comments all statistics varied stronger for private eConsultations. In the case of private eConsultations the participation rates ranged from 1% for Concept Master Program over 20% for the EU Cluster Manifesto and the Journal Rating to 75% in the case of the Organisational Handbook and Postdoc Career Development. While it is not meaningful to measure participation rates for public eConsultations per se one can state that between 15 and 30% of those directly invited participated in a public eConsultation under consideration.

Table 3. Descriptive Statistics Public eConsultations

Statistic	Users	Paragraphs	Votes	Comments
Minimum	67	51	1231	151
1st Quantile	155	64	1500	190
Median	217	192	2431	212
Mean	320	261	3998	414,4
3rd Quantile	411	269	6828	713
Maximum	750	729	8000	806
CoV	0,85	1,06	0,79	0,77

Table 4. Descriptive Statistics Private eConsultations

Statistic	Users	Paragraphs	Votes	Comments
Minimum	23	19	43	15
1st Quantile	37,75	29,75	448,2	74,5
Median	59,5	43,5	716	142
Mean	92,5	129,75	1090,4	165,2
3rd Quantile	111	197,75	1206,5	210,2
Maximum	303	476	4039	378
CoV	0,99	1,23	1,16	0,77

Table 5. Regression Model for the Number of Comments

Parameter	Estimate	Std. Error	t value	Pr(> t)
Number of Users	1,07	0,12	8,59	3,31e-06 ***
Number of Paragraphs	0,33	0,12	2,73	0,0196 *

Table 6. Regression Model for the Number of Votes

Parameter	Estimate	Std. Error	t value	Pr(> t)
Number of Users	11,23	0,84	13,3	4,02e-08 ***
Number of Paragraphs	1,58	0,83	1,9	0,0839

2.2. Type-Free Model

In order to measure the influence of the number of users, document size and type of consultation on the number of votes and comments obtained we perform a covariance analysis, where the type of consultation is the factor and the number of paragraphs and number of users are the covariates. We start out with a specification without the factor, where the number of comments and votes is explained as a linear function of the number of users and paragraphs:

$$Y_i = \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i \tag{1}$$

where Y_i denotes the number of comments/votes of eConsultation i , X_{1i} the number of participants of eConsultation i , X_{2i} the number of paragraphs discussed in eConsultation i and ε_i the error term, which is assumed to be distributed as $N(0,\sigma)$.

Table 5 contains the parameter estimates for the model explaining the number of comments. Both parameters are significant, same as the overall model with multiple R-squared 0,92, adjusted R-squared 0,91, residual standard error 107,7 on 11 degrees of freedom and F-statistic 63,15 on 2 and 11 DF with p-value 9,344e-07.

Table 6 contains the parameter estimates for the model explaining the number of votes. Again, both parameters are significant, same as the overall model with multiple

Table 7. Regression Model for the Number of Comments with type-specific paragraph slopes

Parameter	Estimate	Std. Error	t value	Pr(> t)
Number of Users	1,08	0,11	9,64	2,22e-06 ***
Number of Paragraphs Public	0,2	0,13	1,46	0,17
Number of Paragraphs Private	0,59	0,18	3,33	0,00758 **

R-squared 0,96, adjusted R-squared 0,95, residual standard error 732,9 on 11 degrees of freedom and F-statistic 125,7 on 2 and 11 DF with p-value 2,649e-08.

2.3. Comment Model with Type-Specific Paragraph Slope

Thus, if the particular type of an eConsultation planned is not known, one can state that one can expect 11 votes and 1 comment per user and 1,6 votes and 0,3 comments per paragraph. Using this model as benchmark more complex models can be derived by introducing type specific intercepts and/or slope parameters. These models were estimated and compared to the simpler versions via an F-Test for nested models. It turned out that only the model for the number of comments with a type-specific slope parameter for the number of paragraphs yields a significantly better fit as the benchmark:

$$Y_i = \beta_1 X_{1i} + \beta_2 X_{2i} I(i) + \varepsilon_i \tag{2}$$

where Y_i denotes the number of comments of eConsultation i and $I(i)$ is an indicator variable indicating the type of eConsultation i (private or public).

This model has a multiple R-squared 0,94, adjusted R-squared 0,92, residual standard error 97,44 on 10 degrees of freedom and F-statistic 52,61 on 3 and 10 DF with p-value 1,983e-06. For model (1) $RSS = 127658$ for 11 DF, while for model (2) $RSS = 94946$ for 10 DF, so that the F-Test statistic is significant at $Pr(>F) 0,0931$. Thus the statement made at the end of the previous section can be refined as follows: one can expect 11 votes and 1 comment per user and 1,6 votes per paragraph. The size of the document discussed does not significantly influence the number of comments per user for public eConsultations, while for private eConsultations one can expect 0,6 comments per paragraph.

3. Implications

One can therefore conjecture that on the average private eConsultations yields more feedback in terms of comments of the participants. However, when considering the propensity to participate this number fluctuates more when compared to public eConsultations. The reason for this phenomenon could be that it is easier to communicate the relevance of a more focused issue to a smaller group than a broader more abstract one to a more heterogeneous group. In the latter case the differences are averaged out, while in the former one there is the risk that the issue is not considered relevant at all. An indication for this is that the eConsultation of the Organizational Handbook is the private eConsultation with the highest positive residual against models (1) and (2). This can be explained by the fact that a voting observer will be directly affected by the provisions made in the organizational handbook and thus has a strong incentive to

participate and to contribute. On the other hand, the eConsultation of the Concept Master Program shows the largest negative deviation, probably because the small and medium-sized Austrian companies invited seldom recruit graduates of an international academic program.

Should one therefore stop funding public eConsultations as advocated in Martin et al. [18]? We think not. Even though in such cases one cannot expect the same intensity of participation than in more focused undertakings, the feedback gained is far higher and media rich than, for instance, in the case of traditional market surveys. In fact, as described in Gadner, Leo [3], the Austrian Research Strategy project was perceived as very successful and for this project the initiator Austrian Council received the "European Public Sector Awards 2011 (ESPA 2011)". Incidentally, this eConsultation shows the highest positive residual against model (1) among the public eConsultations under consideration. Nevertheless, public eConsultations entail considerable and tailor-made effort to create awareness and to communicate the relevance and trustworthiness of the effort.

Potential initiators of bottom up projects lack the budget for such activities, but might be able to count on the intrinsic relevancy of the issue under debate. Due to the higher relevancy risk, this group of initiators does not need sophisticated configurable systems for engagement but rather a standardized and easy to set up tool so that the effort lost in case of a relevancy gap is limited. Therefore, based on the experiences made, cbased has decided to offer two platforms: the cbased platform www.cbased.com, on which custom-made projects are made, and discuto, which provides a set up within minutes and a fully automated project management (see www.discuto.io).

4. Outlook

The findings presented are clearly of a preliminary nature. On the one hand a larger data set is needed to be able to better discriminate among more complex models including nonlinear alternatives. On the other hand the scope of the analysis has to be broadened: in order to forecast and control participation insights into the motives and perceived benefits and costs of participation are needed for various types of target communities. Therefore, surveys and focus groups are scheduled for the next project phase as the basis for quantitative and qualitative analysis. Also, the scope will be broadened by also looking at the implementation phase and the long term effects on the organizational culture on the basis of the system theoretic model by Kasper [10].

References

- [1] Kim, Byoungju, *The British parliamentary e-consultation system: a case study of e-consultations*. University of Southampton, School of Social Sciences, Doctoral Thesis, 2012.
- [2] Enrico Ferroa, Euripidis N. Loukis, Yannis Charalabidis, Michele Osellad, Policy making 2.0: From theory to practice, *Government Information Quarterly*, **30**, Issue 4, October 2013, 359–368.
- [3] Johannes Gadner, Hannes Leo, Innovation Policy Counseling 2.0: How Open and Community-Based Innovation Processes Promote Political Decision Making, *The Office of Science & Technology's online magazine on S&T policy in Europe and North America*, **28**, December 2010.
- [4] <http://www.cbased.com/en/consultation/plattform-forschungsinfrastruktur-rat-fur-forschung-und-technologieentwicklung>, retrieved on March. 14th, 2014.
- [5] <http://expectations2012.eu/en>, retrieved on March. 14th, 2014.
- [6] <http://www.forschungsstrategie.at/>, retrieved on March. 14th, 2014.

- [7] <http://www.iktstrategie.at/>, retrieved on March. 14th, 2014.
- [8] <http://www.energieforschungsstrategie.at/>, retrieved on March. 14th, 2014.
- [9] Davy Janssen, Raphaël Kies, Online Forums and Deliberative Democracy: Hypotheses, Variables and Methodologies, e-Working Papers 2004/01.
- [10] Helmut Kasper, *Die Handhabung des Neuen in organisierten Sozialsystemen*. Springer Verlag, Berlin, Heidelberg, New York, 1990.
- [11] Raphaël Kies, Stéphanie Wojcik, European Web-Deliberation, Lessons From the European Citizens Consultation, in Fiorella De Cindio, Ann Macintosh, Cristian Peraboni (eds.), *Online Deliberation, Fourth International Conference, OD2010*, Leeds, UK, 30 June–2 July, 2010, Proceedings, 198–212.
- [12] Jooho Lee, Soonhee Kim, Active Citizen E-Participation in Local Governance: Do Individual Social Capital and E-Participation Management Matter? Working Paper, 2013.
- [13] Jooho Lee, Soonhee Kim, Active E-participation in Local Governance: Citizen Participation Values and Social Networks, 2012 *EGPA Conference: PSG I Information and Communications Technologies in Public Administration*, September 5–8, 2012 Bergen, Norway.
- [14] Soonhee Kim, Jooho Lee, E-Participation, Transparency, and Trust in Local Government, *Public Administration Review*, **72**, Issue 6, November/December 2012, 819–828.
- [15] Euripides Loukis, Maria A. Wimmer, Analysing Different Models of Structured Electronic Consultation on Legislation Under Formation, in Fiorella De Cindio, Ann Macintosh, Cristian Peraboni (eds.), *Online Deliberation, Fourth International Conference, OD2010*, Leeds, UK, 30 June–2 July, 2010, Proceedings, 14–26.
- [16] Ann Macintosh, Ella Smith, Citizen Participation in Public Affairs, in Roland Traunmüller, Klaus Lenk (eds.), *Electronic Government*, Lecture Notes in Computer Science, Volume 2456, 2002, 256–263.
- [17] Eleni Panopoulou, Efthimios Tambouris, Konstantinos Tarabanis, eParticipation Initiatives in Europe: Learning from Practitioners, in: Efthimios Tambouris, Ann Macintosh, Olivier Glassey (eds.), *Electronic Participation*, Lecture Notes in Computer Science, Volume 6229, 2010, 54–65.
- [18] Pedro Prieto-Martín, Luis de Marcos, Jose Javier Martínez, The e-(R)evolution will not be funded: A transdisciplinary and critical analysis of the developments and troubles of EU-funded eParticipation, *European Journal of ePractice*, **15**, 2012, 62–89.
- [19] Simon Smith, Ann Macintosh, Jeremy Millard, A three-layered framework for evaluating e-participation, *International Journal of Electronic Governance*, **4** (4), 2011, 304–321.
- [20] Taudes, Alfred, How the discuto consensus meter works, <https://www.discuto.io/en/blog-entry/how-discuto-consensus-meter-works>, retrieved on June 6th, 2014.

A Framework for Evaluating the Impact of E-Participation Experiences

Cristina PEREZ ESPES^{a,1}, Maria A. WIMMER^b and José María MORENO-JIMENEZ^a

^a *University of Zaragoza, Zaragoza, Spain*

^b *University of Koblenz-Landau, Koblenz, Germany*

Abstract. Over the past decade, the inclusion of citizens in political decision-making through electronic participation (e-participation) has received much attention. Many projects have been, and are continued to be executed at different levels of government. E-participation projects aim at providing a facilitating online environment, where citizens and other relevant actors can be involved in the processes of public decision-making. Up to now, the evaluation of the success and impact of such projects has not been addressed widely in research. This paper studies existing evaluation approaches and details the EF³-framework, which was developed to assess effectiveness, efficacy and efficiency of e-participation experiences. The EF³-framework has been reviewed, revised and applied to the e-cognocracy real-life experience of the municipality of Cadrete (Zaragoza) to provide a proof of concept for assessing impact of e-participation via the EF³-framework. Also, the EF³ framework has been validated by international experts, who also assigned weights to individual indicators for each of the three criteria. The revised model with details of indicators, the proof of concept of Cadrete, and the results of expert reviews and assignments of weights to criteria are summarised in this paper.

Keywords. E-participation, e-cognocracy, evaluation, effectiveness, efficacy, efficiency

Introduction

A decade ago, the OECD stated in a report that a major challenge was “evaluating e-participation: making sense of what has, or has not, been achieved; understanding how to assess the benefits and the impacts of applying technology to the democratic decision-making processes” [1]. Since then, and as the academic literature on e-participation is growing, a number of papers that discuss methodological frameworks for the evaluation of e-participation experiences have emerged (e.g. [2],[3],[4],[5]). Yet so far, these evaluation approaches are restricted to project-related aspects or are not yet rigorous enough to assess the wider impact of an e-participation endeavour.

Especially when an e-participation experience or project is financed by public funds, evaluation and in particular wider impact assessment should be mandatory. Nevertheless, although the importance of rigorous evaluation of e-participation projects is recognised, there is little evidence of the use of evaluation methodologies also in practice.

In April 2010, Moreno-Jiménez proposed the EF³-approach, which was developed for the e-cognocracy evaluation, based on a real-life experience in Spain, through the use

¹ Corresponding Author: Cristina Pérez Espés, University of Zaragoza, Gran Via 2, 50005 Zaragoza, Spain, E-Mail: perezesp@unizar.es.

of the Structural Equation Models (SEM) method. The result of that work was a theoretical framework identifying the relevant aspects that determine effectiveness, efficacy and efficiency (EF³) of an e-cognocracy experience [6]. This paper extends that framework to any e-participation experience, details the approach and presents its validation by a group of international experts. The experts also assigned weights to the attributes considered relevant for the revised framework. The paper is structured as follows: Section 1 presents the EF³-approach proposed for e-cognocracy and its adaptation to any e-participation experience; Section 2 applies the revised framework to the Cadrete (Zaragoza, Spain) experience within the context of e-cognocracy; Section 3 includes the experts' validation of the revised framework and the assignment of weights to attributes and indicators. Finally, Section 4 highlights the most relevant conclusions and future work.

1. EF³-approach for evaluating e-participation experiences

Moreno-Jiménez argues that the following three areas are commonly used when evaluating the behaviour of enterprises: strategic, tactical and operational planning [7]. The EF³ framework as introduced in [6] integrates these ideas by contemplating three main criteria for success and impact as follows:

- a) Effectiveness, which is associated with strategic planning or long-term behaviour and which investigates aspects relevant to the resolution of a problem (doing what is right);
- b) Efficacy, which is associated with tactical planning or medium-term behaviour and is related to measuring how well the goals that are settled are achieved;
- c) Efficiency, which is associated with operational planning or short-term behaviour and is measuring best possible allocation of public resources (doing things correctly).

In the next two subsections, we outline the theoretical framework of EF³ as introduced in [6] and detail the attributes and indicators for evaluating each of the criteria.

1.1. Theoretical framework

Figure 1 shows the theoretical EF³-framework as presented in [6], which identifies relevant aspects required for evaluating e-cognocracy based on the real-life experience (Cadrete, Spain). As shown, the framework integrates effectiveness (doing what is right), efficacy (achieving goals) and efficiency (doing things correctly) and can be considered an extension of the technology acceptance model (TAM) [8] and the Delone & McLean [9] approach: the perceptions and behaviour of citizens are used to evaluate the processes of citizen participation and the adoption of technology, as employed in the case of e-cognocracy ([10],[7],[11]). Cognitive democracy (e-cognocracy) is a concept of citizen participation that combines liberal or representative democracy and direct or participative democracy to cognitive ends. It seeks the creation and social diffusion of knowledge and the construction of a more open, transparent, cultured, educated and freer society; a society that is more cohesive and connected, more participative, egalitarian and cooperative. The e-cognocracy system uses multi-criteria decisions as its methodological support, the internet as its communication support and the democratic system as a catalyst for learning [10].

This theoretical framework was first evaluated through a survey implemented in the real-life experience of Cadrete using SEM, or Covariance Structure Analysis approach ([12-15]), which was chosen as it allows the researcher to formulate and evaluate the existence of latent variables from the reflected indicators [13], that is to say, variables that are not susceptible to direct observation. The software used was EQS 6.1 [15].

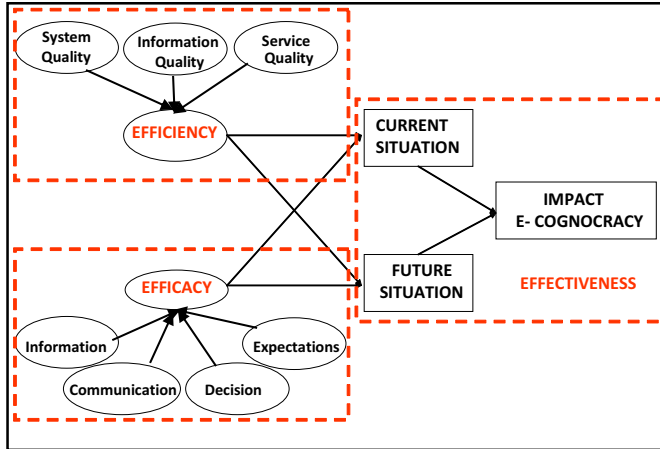


Figure 1. Theoretical EF³ framework for the evaluation of e-cognocracy as suggested in [6]

Due to the limited number of responses, it was not possible to validate a general framework for the conjoint evaluation of all the aspects outlined in the theoretical EF³ framework. Nevertheless, results obtained from the 20 valid responses identified a series of relationships that contributed to the formulation of a general framework [6]. The small sample size means that the evaluation and selection of the models is governed by goodness of fit (GFI) indicators that do not directly depend on the number of observations [12]: SRMR (Standardised Root Mean square Residual), GFI Goodness-of-Fit Index) and CFI (Comparative-Fit Index) (cf. [16] for explanations on determining model fit in SEM). For all the measured and/or structural models, the estimated parameters were presented in their completely standardised version, norm 0-1, and, in addition, all the equations were given their corresponding coefficients of explained variance. The assessment of the construct is based on the methodology proposed by Bagozzi [17] for the validation of multidimensional constructs and the covariance structure analysis of observed variables (McDonald's omega coefficient [18] and Fornell and Larcher's coefficient, C-FL [19]. The stability of the parameters of the models was estimated and evaluated sequentially.

The relevant aspects determining efficiency as outlined in Figure 1 are based on the three constructs contemplated by the model of Delone & McLean [9]: the Information Technology application (System Quality), the information that is obtained (Information Quality) and the human resources support (Service Quality).

Four constructs are considered for the evaluation of efficacy: Information, Communication, Decision and Participation Expectation. Information can be considered as a unidirectional flow of interaction (usually from the administration to the citizens). Communication is understood as two-way interaction: debate and discussion. In addition to the bi-directional flow of information, Decision includes the production of a co-decision between the Administration and Citizens. Finally, Participation Expectation

refers to the identification of the characteristics that participation experiences should have in the future.

Effectiveness is through the analysis of two scenarios as latent intermediate variables: the current situation and the ideal, and an endogenous variable that captures the idea of the creation of a better society.

A simplified analysis of the EF³-framework with the three criteria (Effectiveness, Efficacy and Efficiency) was carried out in a particular experience and with a limited number of responses (20 valid) [6]. It has not let us get significant statistical conclusions. However, it has allowed us to obtain ideas for revising the existing EF³-framework and, together with studying the existing literature, to extend the frame-work to any e-participation experience.

1.2. Revised EF³-framework for e-participation experiences

After identifying the relevant aspects from evaluating the theoretical EF³-framework of e-cognocracy, and with the aim of extending the framework to any e-participation experience, the next step was to revise the framework for each criteria (effectiveness, efficacy and efficiency). This included identifying a set of attributes, indicators and weights for evaluating e-participation experiences, which we describe next.

Table 1. Attributes and indicators for the evaluation of effectiveness

CRITERIA: EFFECTIVENESS			
	ATTRIBUTES	DESCRIPTION	INDICATORS
P E O P L E	CONTROL (CO-DECISION)	The % of the citizens in the decision making process and the possibility of putting forward specific situations that are conjointly resolved and validate the politicians that are in power (motions of confidence in decisions).	% assigned to citizens to decide a policy/decision
	PARTICIPATION (CO-CREATION)	Participation has been evaluated in many ways; in this case, the people that follow the discussions that create content and those that vote will be measured, along with the number of arguments that can be extracted from the discussion and decision processes	Clear track from participatory endeavour to the political decisions and the policy implementation
			People who contributed to improve the participation
			How many topics were proposed for implementing the participation process
			% of participation of population contributing to the polls
			% of participation of population contributing to the discussion; number of messages
S O C I E T Y	LEARNING (FORMATION)	The changes in and impacts of individual preferences between the two voting rounds and the discussion stage. The opinions of the others participants have influenced their final decisions.	I think the discussions in the forum influenced my decision (question of a survey)
	FREEDOM (TOLERANCE)	The % of vetoed messages; the % of ideologically intransigent messages; the % of individuals with a change in the preference structure.	% censored messages; % ideological intransigent messages
	SUBSISTENCE	The selection of the best individuals for the management of the systems	Under the current system, representatives defend my interests (question of a survey)
	COHESION	Qualified consensus (clear majorities) and limited veto. The number of groups that can be identified among individuals must be determined in the final decision.	Homogeneity of opinions, preferences and norms
	EQUITY	Equal opportunity for all. There should be no digital, economic, social or cultural divides.	The Administration informs society about the decisions made and the existing mechanisms for citizen participation (question of a survey)
	SOCIAL WISDOM	The creation of a cultural resource of ethical values. The leaders should become a point of reference for society and, by example, engender ethical values (the social rejection of corruption, dishonest behaviour etc.).	The e-participation experience contributes to a better society (question of a survey)

Effectiveness, as associated with analysing “doing what is right” and evaluating “current situation”, “future situation” and “impact of e-cognocracy” [6], is now extended to incorporate relevant attributes and indicators for the evaluation of effectiveness. An initial set of attributes evaluating effectiveness was proposed in [20]. This set is now refined and grouped into attributes related to the individual perception as well as attributes related to the impact on whole society. The attributes and indicators are shown in Table 1.

Efficacy, assessing the achievement of goals [7], considers four attributes as indicated in Figure 1 and described above. The revision of the framework incorporates the associated indicators for each attribute as shown in Table 2. The extension refers therefore to the inclusion of the attributes to evaluate each indicator as already contained in the original theoretical EF³-framework.

Table 2. Attributes and indicators for the evaluation of efficacy

CRITERIA: EFFICACY		
ATTRIBUTES	DESCRIPTION	INDICATORS
INFORMATION	Existence of an unequivocal Administration-Citizen relationship	Government informs society about the mechanisms of citizen participation and the decisions taken
COMMUNICATION	Existence of feedback	Government takes the opinions of the citizens into account in their decisions
DECISION	A higher level of the relationship, that is to say, implication in the result or final selection	Citizens influence the making of public decisions
EXPECTATIONS	Active participation and conjoint decision	Citizenry and their representatives should jointly participate and decide on the design of public policies

Efficiency, being associated with assessing “doing things correctly” [7], also embarks on the three attributes the original framework proposes but details these by also adding indicators as shown in Table 3.

Table 3. Attributes and indicators for the evaluation of efficiency

CRITERIA EFFICIENCY		
ATTRIBUTES	DESCRIPTION	INDICATORS
System Quality	Information Technology application should consider items like: Convenience, Navigation, Interactivity, Response time, Access	The tools used in the experience were appropriate, easy to use, navigate etc.
Information Quality	The obtained information should contemplate items like: Precision, Relevance, Reliability, Ease of Understanding, Usefulness, Conciseness	The information was easy to understand, appropriate, without mistakes...
Service Quality	The human resources support should contemplate items like: Interpersonal quality, Empathy, Responsiveness, Flexibility	Level of help from the support staff when participating in the experience

In the next section, we exemplify the application of the framework to the Cadrete case to provide a proof of concept, before we outline the results from validating this revised framework of EF³ through international experts in section 3.

2. Application to a real-life experience

In April 2010, the Cadrete Municipal Council, in collaboration with Zaragoza Multicriteria Decision Making Group (GDMZ), implemented a citizen participation project (<https://participa.cadrete.es>) that aimed at giving the residents of the municipality a voice in public policy decisions. The issue in question was the design of cultural and sporting policies. The GDMZ's objective was to validate the methodological and technological tools. The City Council had two main objectives as follows: (i) decisions on the budget assigned to the aforementioned policies would be conjointly made by the politicians and the citizenry; (ii) citizens would be encouraged to involve themselves in the debate and take part in the decision making process, and more specifically, that the arguments that supported the decisions would be publicly disseminated.

Participation was encouraged by the incorporation of a new group of actors: the neighbourhoods association. Therefore, three groups of actors were involved that were given different weightings: (i) the politicians, with a weighting of 40%; (ii) the citizens with 44%; (iii) the local associations with 16%. The participants were local residents (on the electoral register) of over 18 years of age (politicians, citizens and representatives of the local associations). Two voting options were provided: (i) National Identity Card or (ii) username and password. In accordance with e-cognocracy, two voting rounds were interspersed by a forum discussion, which emitted 61 messages, of which 37 were related to cultural polices and 24 to sport.

After finishing the project, participants were asked to complete an online questionnaire to evaluate the attributes. The measurement scale of the questionnaire was from 0 to 10 (0 = total disagreement, 10 = total agreement). 51 questions were grouped into 7 sections: (i) The System of Citizen Participation; (ii) The Creation of a Better Society; (iii) Motivation; (iv) Evaluation of the Technological Support and Applications; (v) Evaluation of the Information; (vi) Evaluation of the Support Personnel and (vii) Overall Evaluation. 24 residents responded and 4 of the replies were invalid. Questionnaires were considered as invalid if: (i) less than 80% of the questions were answered; and (ii) if there was zero variability with regards to the total number of questions [11].

The subsequent tables outline the application of the revised EF³ framework to evaluate effectiveness, efficacy and efficiency of the e-participation experience in Cadrete, which was also presented to the international experts for review (cf. section 3.1).

Table 4 shows the indicators and the value obtained in order to evaluate each attribute of effectiveness in the real-life experience. Some of the indicators selected are questions from the survey (they are the average (mean value) of the scores given by the citizens of Cadrete in the survey). Table 5 shows the indicators and the value obtained in order to evaluate each attribute of the efficacy. The indicators selected are questions from the survey. The "Cadrete's values" are the average (arithmetic mean) of the scores given in the questionnaire by the citizens of Cadrete. Table 6 shows the indicators and the values obtained to evaluate each attribute of efficiency. The indicators selected are questions from the survey. The "Cadrete's values" are the averages (= mean value) of the scores given by the citizens of Cadrete in the questionnaire.

In this section, we have shown the application of the framework to the Cadrete case to provide a proof of concept of the EF³ framework. In the next section, we present the results from validating the revised framework by international experts.

Table 4. Indicators and value obtained for the effectiveness evaluation of the Cadrete experience

CRITERIA: EFFECTIVENESS			
	ATTRIBUTES	CADRETE'S INDICATORS	CADRETE'S VALUE
P E O P L E	CONTROL (CO-DECISION)	% assigned to citizens to decide a policy/decision	Politicians: 40%; Citizens: 44%; Associations: 16%
	PARTICIPATION (CO-CREACCION)	Clear track from participatory endeavour to political decisions and policy implementation	100%
		People who contributed to enhance the participation	Team research
		How many topics were proposed for implementing the participation process	One topic (Culture activities and sports activities)
		% of participation of population contributing to the polls	1st Round: 14.96%; 2nd Round: 17.60%
		% of participation of population contributing to the discussion; number of messages	Cultural messages: 61% (37); sport messages: 39% (24); Cultural Comments: 58% (114); Sports comments: 42% (81)
		Number of political representatives engaging, including meetings with the citizens	7 meetings
	LEARNING (FORMATION)	I think the discussions in the forum influenced my decision (a question of the survey)	Average: 2.30 (1-10)
	FREEDOM (TOLERANCE)	% censored messages; % ideological intransigent messages	0%
	SUBSISTENCE	Under the current system of PC, representatives defend my interests (a question of the survey)	Average: 5.45 (1-10)
S O C I E T Y	COHESION	Homogeneity of opinions, preferences and norms	-
	EQUITY	The Administration informs the society about the decisions made and the existing mechanisms for citizen participation (a question of the survey)	Average: 5.45 (1-10)
	SOCIAL WISDOM	The e-participation experience contributes to a better society (a question of the survey)	Average: 7.73 (1-10)

Table 5. Indicators and value obtained for the efficacy evaluation of the Cadrete experience

CRITERIA: EFFICACY		
ATTRIBUTES	CADRETE'S INDICATORS	CADRETE'S VALUE
INFORMATION	The Administration informs society about the mechanisms of citizen participation	Average: 5 (0-10)
	The Administration informs society about the decisions taken	Average: 4.7 (0-10)
COMMUNICATION	The public authorities consider the opinions of the citizens in the design of public policies	Average: 5 (0-10)
DECISION	Citizen has influence on the political decisions that are taken	Average: 4.85 (0-10)
EXPECTATIONS	The citizenry should participate in the design of public policies	Average: 5.8 (0-10)
	The citizenry and their representatives should jointly decide on the design of public policies	Average: 7.15 (0-10)

Table 6. Indicators and values obtained for the efficiency evaluation of the Cadrete experience

CRITERIA: EFFICIENCY		
ATTRIBUTES	CADRETE'S INDICATORS	CADRETE'S VALUE
System Quality	The computers were appropriate	Average: 6.7 (0-10)
	The presentation structure of the software was simple and understandable	Average: 5.1 (0-10)
	It was easy and convenient to move from screen to screen (navigate)	Average: 5.75 (0-10)
	The voting system was easy to use	Average: 5.8 (0-10)
	The discussion system allowed me to incorporate arguments was adequate	Average: 5.05 (0-10)
	The discussion system has allowed me to know other people's views and share my own views	Average: 5.2 (0-10)
	I believe that my anonymity was assured throughout the process	Average: 6.4 (0-10)
	Overall, I liked the design of the software application	Average: 5.8 (0-10)
	Overall, I am satisfied with the application used	Average: 5.95 (0-10)
ATTRIBUTES	CADRETE'S INDICATORS	CADRETE'S VALUE
Information Quality	It has been easy to understand	Average: 6.9 (0-10)
	It has been appropriate	Average: 6.85 (0-10)
	It was received on time	Average: 6.35 (0-10)
	Basically, it didn't present mistakes	Average: 5.9 (0-10)
	In general, I am satisfied with the proportionate information	Average: 6.9 (0-10)
ATTRIBUTES	CADRETE'S INDICATORS	CADRETE'S VALUE
Service Quality	Support staff helped in the development of citizen participation process	Average: 8.45 (0-10)
	Support staff provided additional information	Average: 8.15 (0-10)
	Without the support staff, I would not have been able to participate	Average: 5.85 (0-10)
	Overall, I am satisfied with the help of support staff	Average: 8.5 (0-10)

3. Validating the framework through international experts

The revised EF³ framework as put forward in section 1.2 was validated by a group of experts through a questionnaire. In this section, we outline the methodical validation context and describe the contributions of the experts including suggestions for revision and the assignment of weights to attributes and indicators of the three criteria.

3.1. Methodical context of expert validation

The revised EF³ framework was reviewed and validated by international experts that were selected from the contacts of the authors and from scanning literature on e-participation evaluation. Nine experts agreed and filled in the questionnaire. They have the following backgrounds (names and locations omitted for anonymity purposes):

- Four professors with academic backgrounds in: economics & operations res., e-government, political sciences, public administration & law & statistics
- Five senior experts with competencies in: citizen participation, e-participation, political science, public administration, public law.

The validation of the revised EF³ framework was performed through a written questionnaire. Experts responded with their views and weights. The questionnaire was structured in three parts: (1) The revised EF³ framework was introduced. Experts were asked to validate the framework by commenting the criteria and respective sets of attributes and indicators as explained in section 1. Experts could also suggest amendments or revisions. (2) Experts were asked to assign weights to each attribute of a criterion based on the expert's perceived importance of respective attributes. (3) The application of the revised framework to the real-life experience in Cadrete was presented. Experts could provide suggestions and changes or comments to the exemplification of the evaluation framework.

3.2. Feedback of the group of experts on the framework

Overall, experts agreed with the need for fine-tuning indicators to make e-participation experiences clearly measurable by establishing qualitative or quantitative measurements thereby being specific. Almost all experts advised that more details on the indicators would make it easier to understand the meaning of each one.

With respect to Effectiveness, it was suggested that the attribute "social wisdom or collective intelligence" be renamed into "civic intelligence" as e.g. put forward in [21]. Likewise, experts suggested that the attribute named "subsistence" might be better called "significance", as this concept would better indicate the selection of the individuals who can contribute more.

With respect to Efficacy, most experts agreed with the need for explaining better the differences between the indicator of "communication" and "decision". Some experts advised to take into account the term accountability, especially when "in-formation" and "communication" are referred to. Others suggested that Efficacy is just an attribute called "engagement" with four or three levels and they think that "expectations" should not be contemplated as an attribute of Efficacy.

With respect to Efficiency, most experts agreed with this term being an economic concept confirming the need to analyse the effort and result in relation to resources expended. Others suggested including another attribute: "quality of participation". Some

of them commented that the human resources support could influence in the final decisions of the citizen, accordingly confirming the attribute “service quality”.

3.3. Assigned weights

The arithmetic mean of the weights assigned to attributes given by each expert individually is shown in Table 7. Some experts did not assign weights to the attributes because they consider that all indicators should have the same importance without discrimination among them.

Table 7. Assigned weights to each attribute of the three criteria					
EFFECTIVENESS				EFFICACY	
ATTRIBUTES		WEIGHT		ATTRIBUTES	WEIGHT
P E O P L E	Control (Co-Decision)	27%	56,0%	Information	21,00%
	Participation (Co-creation)	46%		Communication	25,00%
	Learning (Formation)	15%		Decision	26,00%
	Freedom (Tolerance)	12%		Expectatives	28,00%
S O C I E T Y	Subsistence	19%	44,0%	EFFICIENCY	
	Cohesion	18%		ATTRIBUTES	WEIGHT
	Equity	33%		System Quality	30,00%
	Social Wisdom	30%		Information Quality	42,00%
				Service Quality	28,00%

Most experts agree with the values being difficult to interpret. They argue that more descriptions are needed as to what questions were asked that give these indicator values. They advise a better match between the questions asked in the questionnaire and the mapping thereof to each criterion of the EF³. Besides, they suggest that the framework should be tested in further e-participation endeavours.

4. Conclusions and future work

This paper presented the attributes and indicators of the revised EF³ framework (efficiency, efficacy, effectiveness) to evaluate the success and impact of e-participation experiences. Furthermore, results of a survey among a group of international experts who validated the framework and assigned weights to the attributes per evaluation criterion were presented. Finally, the revised framework was applied to a real-life experience of Cadrete, Spain, based on e-cognocracy.

It is important to mention that the obtained results are conditioned by the real-life experience that previously was performed in Cadrete (2010). This pilot experience does not only constrain the results but also some of the attributes included in the current framework. In the next revision of the framework, the authors will include the experts’ suggestions and their own ideas in the final framework. It is planned to develop an integral evaluation of the three criteria (effectiveness, efficacy and efficiency) using

multi-criteria technique. Finally, the framework will be applied to others e-participation experiences to enrich the evidence base of evaluation.

References

- [1] OECD, Promise and Problems of E-Democracy: Challenges of Online Citizen Engagement. OECD Publications Service, Paris. 2003, URL: <http://www.oecd.org/governance/public-innovation/35176328.pdf>
- [2] G. Rowe, L.J. Frewer, Public participation methods: A framework for evaluation. *Science, Technology & Human Values* 25(1) (2000), 3-29.
- [3] A. Macintosh, A. Whyte, Towards an Evaluation Framework for eParticipation. *Transforming Government: People, Process and Policy* 2(1) (2008), 16-30.
- [4] G. Aichholzer, H. Westholm, Evaluating e-participation Projects: Practical Examples and Outline of an Evaluation Framework. *European Journal of e-Practice* 7(3) (2009), 1-18.
- [5] M.A. Wimmer, M. Bicking, Method and Lessons from Evaluating the Impact of E-participation Projects in MOMENTUM. In: J.R. Gil- Garcia (Ed.). *E-Government Success Factors and measures: Theories, concepts, and Methodologies*, IGI-Global, 2013, 213-234.
- [6] J.M. Moreno-Jiménez, C. Pérez Espés, P. Rivera, Notes on an EF³-evaluation of e-cognocracy. In Miltiadis D. Lytras et al. (Eds.). *E-learning and Knowledge Management for Human Capital Development*, WSKS 2012. Comm. in Computer and Information Sciences (CCIS) 277. Springer, Heidelberg/Berlin, 2013.
- [7] J.M. Moreno-Jiménez, E-cognocracia: Nueva Sociedad, Nueva Democracia. *Estudios de Economía Aplicada* 24(1-2) (2006), 559-581.
- [8] F.D. Davis, Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 13(3) (1989), 319-340.
- [9] W.H. DeLone, E.R. McLean, The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems* 19(4) (2003), 9-30.
- [10] J.M. Moreno-Jiménez, Las Nuevas Tecnologías y la Representación Democrática del Inmigrante. In ARENERE, J.: *IV Jornadas Jurídicas de Albarracín* (22 pp.). CGPJ. Memoria Judicial Anual de Aragón 2003, 66.
- [11] J.M. Moreno-Jiménez, W. Polasek, E-democracy and Knowledge. A Multicriteria Framework for the New Democratic Era. *Journal Multicriteria Decision Analysis* 12 (2003), 163-176.
- [12] K.A. Bollen, *Structural Equations with Latent Variable*. John Wiley & Sons, Inc., North Carolina, 1989.
- [13] K.A. Bollen, R. Lennox, R., Conventional Wisdom on Measurement: A Structural Equation Perspective. *Psychological Bulletin* 110(2) (1991), 305-314.
- [14] K.G. Jöreskog, D. Sörbom, *LISREL 8: User's Reference Guide*. SSI Scientific Software International, USA, 1996.
- [15] P.M. Bentler, *EQS Structural Equations Program Manual*, Multivariate Software, Encino, CA, 1995-2006.
- [16] D. Hooper, J. Coughlan, M.R. Mullen, Structural Equation Modelling: Guidelines for Determining Model Fit. *Electronic Journal of Business Research Methods*, 6 (1) (2008), 53-60.
- [17] R.P. Bagozzi, A Prospectus for Theory Construction in Marketing, *J. of Marketing* 48 (1984), 11-29.
- [18] R.P. McDonald, *Factor Analysis and Related Methods*. Lawrence Erlbaum Associates, Hillsdale NJ, 1985
- [19] C. Fornell, D.F. Larcker, Evaluating Structural Equation Models with Unobservable and Measurement Error. *Journal of Marketing Research* XVIII (1981), 39-50.
- [20] J.M. Moreno-Jiménez, C. Pérez-Espés, M.A. Wimmer, The Effectiveness of e-Governance Experiences in the Knowledge Society. In: W. Castelnovo, E. Ferrari (Eds.). *ECEG 2013 - 13th European Conference on eGovernment*, Academic Conferences and Publishing International Ltd. 2013, 354-362.
- [21] D. Schuler, Civic Intelligence and the Public Sphere. In: M. Tovey (ed.). *Collective Intelligence: Creating a Prosperous World at Peace*, Oakton, Virginia: Earth Intelligence Network, 2007.

“BiPart” of Participatory Budgeting. A Software Platform for New Political Practices

Stefano STORTONE¹ and Fiorella DE CINDIO

Università di Milano, Milano, Italy

Abstract. Participatory Budgeting (PB) is an yearly deliberative process for citizens to decide directly over the public expenditures. It was born in 1989 in Porto Alegre, Brazil, and awarded in 1996 by the United Nations as one of the world's best practices of local governance. ICTs have been used to support PB initiatives and increase citizens participation. However, the so called Digital Participatory Budgeting (DPB) so far mainly focused to share information on the ongoing process and to carry on the voting phase. The paper outlines the evolution of BiPart, a software platform designed for accompanying the overall PB process, and strengthening the social ties. It also presents its application in seven instances of PB in four municipalities in Italy along five years, to test its actual use and its impact on citizens' participation.

Keywords. E-participation, e-cognocracy, evaluation, effectiveness, efficacy, efficiency

Introduction

Budgeting plays a crucial role in politics as there lies a large part of political power. Moreover, in the current financial crisis an efficient use of public resources and shared decisions about them are compelling goals. In the last decades, the public opinion claims for more transparency, openness and clarity in public policies and budget management. New tools and new methods are also emerging, especially online: social reporting, open data, citizens journalism, crowdsourcing are just few of the innovative solutions to date: they all stress citizens' participation. Participatory Budgeting (PB) structures participation into an articulated and comprehensive process.

PB is a participatory practice through which people are directly involved in the decision-making over the public expenditures. It was born in 1989 in Porto Alegre, Brazil, after the fall of the last military regime, as a results of the pressure exerted by the emergent social movements and the election of the Worker Party to the city government. The aim was to overcome the limits of liberal-democracy and to guarantee more redistribution, more social justice and social cohesion, as well as more public accountability. The positive outcomes drew the attention of international institutions like the World Bank [13]; the UN-Habitat awarded PB as one of the world's best practices of

¹ Corresponding Author: Università di Milano, 20135 Milano, Via Comelico 39/41, stefano.stortone@unimi.it.

local governance [2]. From then on, PB has gained broad acknowledgement, spreading in thousands of cities worldwide [14].

PB has been crafted when (and where) internet did not practically exist and the only way for people to be informed and participate was attending public meetings. Participation did never explode and PB, despite the excellent outcomes, did never gained enough legitimacy to impose itself as an established practice in local governance. As a result, in many places it stopped as quickly as it started. Almost at the same time, several local communities started to use the net to strengthen social ties, empower citizenship and gather civic intelligence [7]. However, the experiences of civic and community networks suffered, conversely, for a lack of deliberative power and a low impact on the real-life policies and politics [7]. Today, these two "worlds" seem to get closer and to overcome their respective weaknesses by merging the democratic deliberative practice of the PB and the lessons learned from early community networks, into the new scenario of the web 2.0, which is spreading participatory practices worldwide and raising the demand of people involvement in public affairs. PB projects are now using digital tools and online spaces to improve information sharing and transparency and to remove space and time barriers, allowing more citizens to participate.

In line with the explosion of the web for political purposes, there is now a growing and renewed interest by local authorities and citizens in PB. This interest calls, on the one hand, for finding or developing software platforms suitable to support PBs, and, on the other one, for experimenting them in real-life settings. The implementation of a dedicated software and its trial in several field cases is the kind of action research approach suggested in [8] for the future of the social web. In the case of PB, it allows researches and practitioners to see whether and how (what features) online participation can really improve the quality of deliberation and the relations among citizens, and increase the rate of citizens' involvement. Aim of this paper is to deal with these issues by introducing the design principles of "BiPart", a still under-development software platform for supporting PB, and analyzing seven cases of PB that uses it. They took place in four Italian cities in the last five years. Both the software and the case studies are initiatives of the Centre for the Study of Participatory Democracy (CSDP), a civic association born to promote PBs.

The paper is organized as follows: Section 2 recalls the main phases of a PB process and its evolution from offline to online; Section 3 presents the software platform "BiPart"; Section 4 illustrates the PB initiatives in parallel with the development of BiPart releases; Section 5 summarizes their outcomes in a comparative way; finally the last section discusses the outcomes with respect to the above research questions.

1. Participatory Budgeting: Offline and Online Practices

PB is a relatively simple process which can evolve into a more complex structure over time. Simply speaking, PB consists of giving citizens of a local community every year the power to: identify priorities, develop concrete proposals and select the projects to finance. Citizens carry on this process directly and/or appointing some fellow citizen to represent them and their priorities, especially when interacting with the local authority and the other stakeholders. Basically, the structure of the PB process consists of four main phases: (1) preliminary debate and submission of proposals; (2) selection of the hot topics and proposals and, in case, delegates who represent them; (3) evaluation and co-design of the projects, in collaboration with the municipal offices; (4) selection of

the projects to be included in the budget law. Sometimes, phase 1 and 2 are merged together. The process continues with the monitoring of the implementation of the winning projects. PB usually involves only a portion of the overall municipal budget, concerning primarily investments for public works (e.g., parks, streets maintenance) and sometimes public services (e.g., welfare or cultural initiatives). Participation is often extended to all residents older than 16 years.

Despite its institutional nature, PB is an informal process. The formal power is held by the traditional representative bodies, Mayor and City Council, which retain the democratic legitimacy by virtue of the elections, and commit themselves to carry the participatory process on and to implement the projects proposed and selected by citizens.² This implicit "participatory contract" [6], that characterizes PB as an option (or an opportunity) rather than a political right, together with the demanding forms of face-to-face participation (like assemblies and periodical meeting), makes PBs usually attended by a small part of the population, around 1–2% [2,14], mainly the most active citizens and/or representatives of the civil society organizations.

In order to overcome these shortcomings, many Municipalities have strengthened their PB by the support of the ICTs. Almost every PB has today its own website, which is often an informative space, as still happens in Porto Alegre.³ Online forms are used for gathering citizens' proposals, e.g., in Chicago.⁴ In other cases, like in New York City (pbnyc.org/idea) citizens can propose and interact online via interactive maps, or through online forums and/or Facebook pages. In many cases, the formal participation (e.g. voting) is still performed offline. The most innovative case is the Digital Participatory Budgeting (DPB) of the Municipality of Belo Horizonte (more than 2 million inhabitants) in Brazil. Since 2006, every two years hundred of thousand citizens vote for a list of projects only via internet and sms [4,10]; some voting stands are also provided. Sms voting – today easy and accessible to almost everybody – is widely used either in the developing countries and now even in some developed cities, like Lisbon (lisboaparticipa.pt) and Cascais (cm-cascais.pt/orcamento-participativo-2013).⁵ In summary, the need of supporting PB with ICTs are plainly emerging, but they are mainly used to sustain still prevailing offline procedures, with tools for supporting some specific actions, namely the voting, but still in a very informal way. ICTs do not accompany the whole PB process yet.

2. BiPart: Be Part of Your Participatory Budgeting

PBs landed in Italy in the early 2000s, mainly promoted by left-coalition local governments, and in a short time hundreds of Municipalities undertook it. These initiatives did not achieve significant outcomes, because they mainly adopted the weak form of PB (see note 3). By consequence, after an initial boom, PB rapidly disappeared [1]. Today, there is a new wave of PB, due to three main reasons: a) a couple of regional laws adopted for promoting participatory processes, including PBs; b) the exponential diffusion of internet and digital social networks among the citizens; c) the rise of the politi-

²Weaker forms of PB, where this commitment is not taken, do also exist [8], but a recent research, anticipated in fb.me/6nxHKVgr8, shows that they are more likely to fail.

³<http://www2.portoalegre.rs.gov.br/op/>. All the URLs have been checked while writing the paper.

⁴<http://www.pbchicago.org/49th-ward.html>; <http://www.sfpb.net/participate.html>.

⁵For sake of inclusiveness, and because of the difficulties to verify people's identity, the Municipalities accept the risk to include non-residents votes.

cal movement MoVimento 5 Stelle (M5S-Five Star Movement) [3], whose young activists, especially when elected in the city councils, work to promote it. PBs are carried on by the Municipalities independently (e.g., the well-known case of Grottammare) or with the support of consulting bodies, such as the CSDP.

The CSDP activity starts in 2009 within the above described context. While most of the agencies employed in facilitating PB stay with the traditional offline process, CSDP has always conceived offline and online participation as intrinsically complementary and relied upon the wider use of the web, according to the available technology. The CSDP also adopts a strongly deliberative approach to PB and designs the democratic participatory process to make it as easy as possible: according with their preferences and needs, citizens can participate in offline and face-to-face venues (assemblies, polling stations and ballot papers distributed at large) as well as online, through dedicated websites.

The first PB in the town of Canegrate in Lombardy (12,000 inhabitants), in 2010, was supported by a simple and very low-cost but still easy-to-use mash-up website. Its main role was to track the current phases of the PB process, and to collect the relevant information mainly derived from other sources like RSS, Twitter, Facebook, YouTube, Google map and calendar. The good results made the initiative pretty known around the country. Taking inspiration from Canegrate, in 2012, Cascina in Tuscany, Cernusco Lombardone in Lombardy, and the Province of Pesaro-Urbino decided to start a PB applying for the advice of the CSDP. These initiatives provided the concrete chance (and resources) to start the development of a dedicated software platform.

Its leading design idea was to create a digital "civic space" where people can: gather, share and debate "civic intelligence"; aggregate themselves around issues and proposals, territorial or thematic groups; strengthen relationships and self-organization. Moreover, the website should mirror and replicate the PB process as developed offline. This would "augment" opportunities and channels for civic action by engaged citizens, paving the way for a more immediate, effective and wider participation. In fact, the website adds persistency to the process, i.e., it should provide a "timeless" civic space alongside a more institutional and deliberative space supporting the yearly PB process. Finally, the platform should be able to support several PB initiatives in parallel, keeping costs low, facilitating the sharing of experiences among them and thus encouraging the creation of a broader community of practices on PB. None of the existing software fulfills all these requirements. The closest was openDCN, but the choice was to finally develop a new software platform from scratch.

BiPart (the name of the software, which is to be read as "BePart") has been developed as a *multi-site platform*, as it can host as many communities and PB initiatives as necessary. Assuming the framework introduced in [6], each site is provided with the following features:

- *community space*: registered citizens can report problems, define intervention priorities, publish proposals, open territorial as well as thematic groups and collect supporters and members around each of these entities. According to the essence of PB, this aims at creating aggregation of interested people around issues and transforming personal contents into collective ones, hopefully developed together. As a groupware technology, each of these entities includes forums for free debates and storage for uploading multimedia documents. They can be georeferenced into the Google map, associated with predefined categories, and tagged, in order to make searching easier. Sharing features to

the most popular social network sites allow groups to advertise their activity. Blog for outside communication and wikis for collaborative writing are features in progress;

- *deliberative space*: each community (usually through the intermediation of a proponent institution such as the Municipality) can structure a PB process according to a well-defined schedule and budget. The administrators of the platform can customize the process accordingly, by selecting the appropriate tool(s) for each phase, allowing citizens to vote for proposals, delegates and/or projects and to monitor the fulfilment of their decisions. When a PB is underway, the homepage allows citizens to follow and to be part of the ongoing activities through: (a) a bar indicating the ongoing phase; (b) a countdown informing the time left until the end of the current phase; (c); banners providing more details and links about the phase; (d) buttons linking dedicated webpages to carry out the actions. Registered citizens who want to perform deliberative actions (e.g., support and vote) can be required to authenticate their account by supplying further identification credentials (such as fiscal code or the personal Id) and the SMS verification code, sent to their mobile number; data will be then verified by the municipal offices;
- *a personal space* will be developed to show the profile, the timeline and the social relationships (e.g., group membership) of the registered users. This is of course *cross-community* as it includes all the entities and news that each user joins and follows within BiPart.

Since its early version – the mash-up solution adopted in 2010 in Canegrate (hereafter: BiPart v0.1) – BiPart has been developed incrementally, in strict relationship with the ongoing initiatives, to support the fundamental interplay between the activities in the online spaces and the social dynamics. Its development followed the design choices of the first PB initiatives, but it is now gradually going to affect the participatory process as well.

BiPart 1.0 was Java-based and allowed only to create and support proposals. It was quickly abandoned. Since version 2.0, BiPart is developed on the LAMP (Linux, Apache, MySQL, Php) environment. It is available as a service at conditions fixed time by time by its owner, the CSDP. The current version, BiPart 3.0, benefits of a substantial revision of the user interface. The software can be reached through the URL www.bipart.it.

3. The Case Studies

Canegrate Partecipa! (canegratepartecipa.org) has been carried in 2010, 2011 and 2013. In the first two years, the available budget to be spent for infrastructures was not particularly relevant: 100 K€ and 150 K€ respectively, out of 11 M€ municipal budget. The development of the PB process costs around 15 K€ each year. These data are summarized in Table 1. The Municipality adopted a very easy PB structure, built on three phases: in the first phase, citizens work out proposals and collect support to let them pass to the second phase, when the municipal offices evaluate the feasibility of each successful proposals. Feasible proposals become projects that are finally put to vote, to find out which one(s) will be funded. Proposals, supports and votes can be gathered through ballot papers distributed door-to-door and in several public places,

and collected in ballot boxes placed in the same public places. They can also be collected through online forms provided by BiPart v0.1. The two voting phases lasted more or less one month each. In 2012 the PB was suspended because of the municipal elections. In 2013, the re-elected administration reduced the budget to 70 K€ because of the financial crisis. The process change remarkably, putting in place a more sophisticated form of support: rather than proposals, citizens assign relevance (from 1 to 10) to each public sector (environment, urban mobility, etc.) and appoint at most three fellow citizens for their priority sectors. The most supported citizens will become part of the PB Council, entitled to develop the projects to vote for.

Cernusco Partecipa! was carried on in 2012 only. It was structured as in Canegrate2010-2011, but in phase 1 people could also appoint a fellow citizen (delegate) to represent the projects. The budget was 100 K€ (plus around 6 K€ for the PB itself), out of 4 M€ municipal budget and 3,800 inhabitants: both these latter parameters depict Cernusco as one third of Canegrate, so the investment, roughly the same, was significantly high. Cernusco used BiPart v0.1 in the phase 1, while for the final voting BiPart 2.0 was already available.

Cascina Partecipa! (cascina-partecipa.org) lasted for two years (2012, 2013) and has been the largest case in terms of financial resources made available both for implementing the citizens' projects and for covering the organizational costs: in 2012 the budget was 1 M€ out of the 50 M€ municipal budget, plus around 55 K€ for the PB process itself. The initiative was partially funded by the Tuscany Region that asked the organizer to include face-to-face and facilitated deliberative meetings, which took a relevant part of the PB process cost. In 2012, the proposal phase was structured as in Cernusco, but the 16 final projects to be voted were selected through deliberative meetings by the 20 most voted delegates and by a representative sample (80 people) of citizens. BiPart 1.0 has been used for the proposal phase and BiPart 2.0 for the online voting. Citizens could also vote for the 16 final projects at the Municipality offices or at moving polling stations; widespread distribution and collection of ballot papers was not provided as it was not sustainable, considering the size of the city. In 2013, the budget was reduced to 350 K€ (plus 37 K€ for the PB process) and the first phase changed considerably: there were no longer delegates and competition on proposals, but an informal gathering of citizens' "demands", collected both offline and online through the version 3.0 of BiPart. A representative sample of citizens then debated those demands and came up with a set of 14 projects to be voted. In the voting phase people were authenticated by the new procedure based on SMS.

In 2014, BiPart has been adopted by the Municipality of Faenza (oplafaenza.it), under the 20 K€ funding by the Emilia-Romagna Region. The CSDP was not involved but for providing the software. The PB was structured again in three phases as in Canegrate2010-2011: proposal&support, evaluation and vote. The budget was 100 K€ out of 110 M€ of municipal budget; the upper bound for each proposal cost was 20 K€. This is the first case in which the website has been the main channel to support and vote proposals: all the proposals, even those raised in the offline deliberative meetings, have to be uploaded. Citizens support proposals through the "I like" action in order to bring them to vote. Differently from the other cases, the municipality did not adopt in phase 2 any authentication of the identity of the participants; this choice affected the participation (see Table 1), as we shall see in the next section. The voting phase lasted 16 days and was mainly considered online. The offline voting was possible at one dedicated municipal office everyday, and at a moving polling station for only two days.

Table 1. Participation figures in the seven cases

				PHASE 2			PHASE 4		
	1	2	3	4	5	6	7	8	9
PB INITIATIVE (CITY+YEAR)	POPULATION	PB BUDGET (in K€)	PB COST (in K€)	TOTAL SUPPORTERS (% of POPULATION)	ONLINE SUPPORTERS (% of TOTAL)	ONLINE SUPPORTERS (% of POPULATION)	TOTAL VOTERS (% of POPULATION)	ONLINE VOTERS (% of TOTAL)	ONLINE VOTERS (% of POPULATION)
Canegrate2010	12431	100	15	426 (03.43%)	28 (06.57%)	0.23%	683 (05.49%)	136 (19.91%)	1.09%
Canegrate2011	12431	150	17	656 (05.28%)	74 (11.28%)	0.60%	1220 (09.81%)	85 (06.97%)	0.68%
Canegrate2013	12431	70	13	234 (01.88%)	16 (06.84%)	0.13%	351 (02.82%)	39 (11.11%)	0.31%
Cernusco2012	3863	100	6	234 (06.06%)	66 (28.21%)	0.41%	550 (14.24%)	65 (11.82%)	1.68%
Cascina2012	44133	1000	55	2250 (05.10%)	93 (04.13%)	0.21%	1550 (03.51%)	889 (57.35%)	2.01%
Cascina2013	44133	350	37	---	---	---	1365 (03.09%)	238 (17.44%)	0.54%
Faenza2014	57973	100	20	2400 (04.14%)	2400 (100%)	4.14%	1353 (02.33%)	1219 (90.10%)	2.10%

4. Early Outcomes

The description of the seven cases provides evidence for the relevant differences among them, namely, the size of the municipalities and the amount of budget put on the table for the PB with respect to the overall budget of the municipality. The structure of each PB also varies, according to specific needs and conditions. Differences affect: the duration of the phases; the mix of offline and online practices, the budget at disposal for organizing the PB process; the communication plan; the versions of the software platform. All these differences make it difficult even to compare PB processes carried on in the same Municipality in different years. The lack of continuity also hampers trends assessment. Other parameters would also be worth of consideration, as they may seriously influence participation: e.g., demographic indicators, relevant for tracking computer skills.

An analysis taking into account all these variables would require significant investments on research. However, the available budget has been allocated mainly to sustain participation, both offline and online, and to develop the participatory features of the software platform. Despite the limited information, we felt committed to analyse and compare the field experiences carried on so far anyway, to orient both PB now starting and the advocated development of the software features. Moreover, as far as we know, the literature lacks of adequate comparative studies and so we hope that our preliminary work can contribute to open a necessary research effort. The data used for the comparison are taken from the official documents of the PB initiatives, enriched with rough data on unique users performing online actions, downloaded from BiPart 2.0 and 3.0. They are all summarized in Table 1. The number of supporters and voters are used to calculate the participation rate, over the population, in the two phases. The rate of online supporters and voters refer to the total number of participants during phase 2 and 4, respectively (rates in column 5 and 7).

We observe that participation in phase 4 is usually larger than in the phase 2, although one can assume that some supporters of the proposals that did not go to vote, abandon the process. This can be explained since voting is a rather simple and familiar activity, and citizens know their votes count for deciding which project(s) will be implemented. The only two exceptions, Cascina2012 and Faenza2014, can be explained as follows: (a) in Cascina2012, the support action in phase 2 was very strong thanks to the widespread distribution and collection of ballot papers, which did not take place in phase 4; moreover, many online votes were cancelled for irregularities; (b) in Faen-

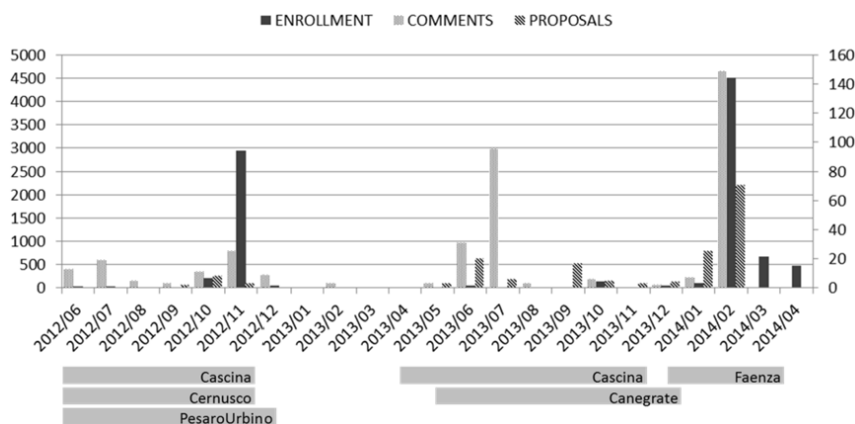


Figure 1. Online (monthly) activity in BiPart and running PB initiatives.

za2014, the high number of supporters was due to the long phase duration (76 days) and to the absence of the authentication procedure, introduced in phase 4.

A positive trend from phase 2 to phase 4 can be observed also considering the online participation over the total participation. Canegrate2011 and Cernusco2012 are two exceptions as they decided to use the massive distribution and collection of ballot papers to make the participation as easy as possible. This of course favoured offline participation. Faenza2014 is beyond consideration as phase 2 was only online.

Cascina2012 and Faenza2014 deserve further attention to explain the two deviations from the average in the online participation: Cascina2012 has the lowest rate in phase 2 (4.13%) and the second best rate in phase 4 (57.35%). The very low rate of online participants during phase 2 can be attributed to the shortcomings of the BiPart v1.0 (after that abandoned) and, as we said, to the choice to balance this problem by collecting proposals and supports through the widespread distribution of ballot papers. In phase 4, in fact, not only citizens enjoyed the most usable BiPart v2.0, but they found easier to vote online rather than offline, because such method were no longer used.

Let's now consider the case of Faenza, the largest city of the sample. The figures show that, even if the phase 2 was developed only online, the overall participation rate (4.14%) approaches cases in which citizens have been involved also with massive offline actions. In the voting phase, Faenza exhibits the lowest rate of overall participation rate (2.33%) but the highest online voting rate (90.10%). This may due to the shortest duration (16 days) and to the weak support to offline participation.

To complete the picture, Fig. 1 shows the data (number of enrolments, scale on the left; number of proposals and comments, scale on the right) from the last versions of BiPart (v2.0 and v3.0) used since the phase 4 in Cascina2012 and Cernusco2012. The enrolment peaks (with the associated activity), at the edges of the Figure, correspond to the voting phases in Cascina2012 and Cernusco2012, and to the supporting phase in Faenza2014, while the online activity in June/July 2013 comes from Canegrate2014. It is worth noting the lack of activity outside of these time periods. This may depend on the fact that BiPart community space is still missing functionalities (such as a dashboard with a timeline and comment notifications) that could enable a broad and continuous public debate. Moreover, people still focus more on voting – and presumably on promoting the vote – rather than debate and build proposals in a collaborative way.

To conclude the analysis, the actual impact of the PB processes must be considered by assessing if the municipal administrations fulfil the commitment taken with their citizens to finance and implement the winning proposals. All the four Municipalities are in some way carrying on the decisions, despite the recent financial crisis has unexpectedly shrunk the municipal budget and postponed the implementation of some projects. This is what happened in Cernusco and Cascina. In Canegrate, the 2010 winning project has been fully implemented, while in 2011 this occurred only partially, and the outcome of Canegrate2013 and Faenza2014 are going to be included in the 2014 budget law. Despite these delays, what matters is the high public commitment of the Municipality to implement the outcomes anyway, and their resulting effort to explain to the citizens the reasons of any possible hurdle.

5. Conclusion

The paper outlines BiPart, a software platform for supporting PBs, and presents its application in seven instances of hybrid (offline and online) PB in four cities in Italy along five years. Despite the difficulties in comparing initiatives which differ in many parameters, some general outcomes can be drawn. Compared with the trend, mentioned in the Introduction, that settles participation in offline PBs between 1–2%, data from the seven cases show that citizens' participation rates was higher in both phases almost everywhere, although they are still far from the best practices of DPB, such as in Belo Horizonte, Lisbon and Cascais.

These encouraging results can be finally explained by two main design choices: the "participatory contract", which strengthens the mutual commitment between citizens and institutions, and the interplay between offline and online venues, which aims at making participation simpler and more accessible. The basic idea behind all the field cases described so far is to overcome the hindrances of the face-to-face meetings, typical of the traditional PB, bringing the participation to people's homes. This has been achieved by making PB "shareable" by and among citizens, through the distribution of ballot papers and the online facilities, enabled by BiPart. However, this kind of offline activity is (more) feasible in small towns. As the community becomes larger, it turns to be too expensive and even more hard manage to participation. The digital solutions are therefore more sustainable, as it maintains a good degree of participation according to the available resources. This is what happened in Cascina2012, where the online participation assumed a more prominent role than the offline, and in Faenza2014, where the last version of BiPart was mature enough to support almost the entire participatory process, balancing the lack of offline actions.

The exception among the seven cases is Canegrate2013. The low rates are probably due to the decision to experiment a new and more complex PB process which, together with other contingencies, created a severe hindrance to citizens' participation, so interrupting the quite well-established process built in the first two years. However, the winning proposal – "providing support to families in economic difficulties" – suggests that the quantitative drawbacks are balanced by the quality of deliberation in terms of social cohesion.

In summary, a carefully-designed interplay between the offline and online is therefore still necessary. On the one hand, the absence of offline procedures could question the PB as non-democratic, because of the well-known "digital divide". On the other hand, digital technologies are nowadays spread enough to be widely used and to help

overcoming the symmetric – although less recognized – “physical divide”. This conclusion fits quite well with the just published chapter by Cardoso Sampaio and Peixoto [4] when they claim: “*Finally, we agree that, given the current experimental phase between the PB and technologies and access issues in developing regions, mixed processes with online and offline phases may be the best solution, though not in an automated way*”; and “*Despite its experimental nature, there is concrete evidence that the relationship between PBs and technologies can be beneficial to participatory processes and that there are still good opportunities that have not been taken*”.

In this open scenario, the seven cases presented in this paper do not constitute a statistically significant sample, but the opening of new PB initiatives will provide further data and more resources to implement software facilities. PB is now running in two large cases: in a district of the city of Turin, the capital of the Piedmont region, (around 90.000 of 870,000 inhabitants; torino.bipart.it), and in the city of Monza (120,440 inhabitants; monza.bipart.it), in the close neighborhood of Milan. They are enjoying some improvements to BiPart, inspired by the former experiences. Among the others: the implementation of the personal space (dashboard, timeline and notification system), the improvements of the community space (groups management), log files and web analytics to get richer participation statistics.

References

- [1] Allegretti, G., Stortone, S.: Participatory Budgets in Italy: Reconfiguring a collapsed panorama. In: Dias, N. (ed.), *Hope for Democracy – 25 Years of Participatory Budgeting Worldwide*, InLoco Edition, pp. 313–324 (2014).
- [2] Avritzer, L.: *Participatory Institutions in Democratic Brazil*. Woodrow Wilson Center Press, Pennsylvania, NW, USA, (2009).
- [3] Bordignon, F., Ceccarini L.: Five Stars and a Cricket. *Beppe Grillo Shakes Italian Politics, South European Society and Politics*, vol. 18.4, pp. 427–449 (2013).
- [4] Cardoso Sampaio, R., Peixoto, T.: Electronic Participatory Budgeting. False dilemmas and true complexities. In: Dias, N. (eds.), *Hope for Democracy – 25 Years of Participatory Budgeting Worldwide*, InLoco Edition, pp. 313–324 (2014), pp. 413–425.
- [5] Cardoso Sampaio, R.: e-Orçamentos Participativos: um mapeamento mundial das experiências já realizadas e suas contribuições para e-participação e e-democracia, Universidade Federal da Bahia. Tese em Comunicação Social (2014).
- [6] De Cindio, F.: Guidelines for Designing Deliberative Digital Habitats: Learning from e-Participation for Open Data Initiatives. In: Davies, T., Bawa, Z. (eds.), *Community Informatics and Open Government Data*. The Journal of Community Informatics, vol. 8.2 (2012).
- [7] De Cindio, F., Schuler, D.: Beyond Community Networks: From Local to Global, from Participation to Deliberation. *The Journal of Community Informatics*, vol. 8.3 (2012).
- [8] Hendler, J., Shadbolt, N., Hall, W., Berners-Lee, T., Weitzner, D.: Web science: An interdisciplinary approach to understanding the web. *Communications of the ACM*, vol. 51.7, pp. 60–69 (2008).
- [9] Matheus, R. et al.: Case Studies of Digital Participatory Budgeting in Latin America – Models for Citizen Engagement. In: Davies, J., Janowski, T. (eds.), *Proceedings of the 4th International Conference on Theory and Practice of Electronic Governance (ICEGOV'10)*, ACM, New York, NY, USA, pp. 31–36 (2010).
- [10] Peixoto, T.: E-Participatory Budgeting: e-Democracy from theory to success? E-Democracy Centre/Zentrum für Demokratie Aarau, e-Working Paper (2008).
- [11] Scherer, S., Wimmer, M.A.: Reference Process Model for Participatory Budgeting in Germany. In: Macintosh, A., Tambouris, E., Sæbø, Ø.: *Electronic Participation (IFIP ePart)*. Springer Berlin/Heidelberg, Nr. 7444. pp. 97–111 (2012).
- [12] Schuler, D.: *New Community Networks: Wired for Change*. Addison-Wesley (1996).
- [13] Shah, A. (eds.), *Participatory Budgeting, Washington*. The World Bank Press (2007).
- [14] Sintomer, Y., et al.: Transnational Models of Citizen Participation: The Case of Participatory Budgeting. *Journal of Public Deliberation*. vol. 8.2 (2012).

A Semantic Deliberation Model for e-Participation

Lukasz PORWOL, Adegbajega OJO and John BRESLIN

Insight Centre For Data Analytics, National University of Ireland, Galway

{lukasz.porwol, adegbajega.ojo, john.breslin}@insight-centre.org

Abstract. There have been very few attempts so far to develop a comprehensive and rigorous conceptualization for deliberations in e-participation. Without a rigorous and formal conceptualization of deliberation, consistent content descriptions creation, deliberation records sharing and seamless exploration is difficult. In addition, no e-participation deliberation ontology exists to support citizen-led e-participation particularly when considering contributions made on the social media platforms. This work bridges this gap by providing a rich conceptualization and corresponding formal and executable ontology for deliberation in the context of e-participation. The semantic model covers the core concepts of technology-mediated political discussion and explicitly supports the integrated citizen- and government-led model of e-Participation enabled by social media. Results from the use of the ontology in describing e-Participation deliberation information at Local Government projects are also presented.

Keywords. e-participation, citizen-led e-participation, e-participation framework

Introduction

e-Participation, implements technology-mediated dialogue between citizens and decision-makers [1] to facilitate, fast-feedback-enabled participation [2] while also introducing new political participation channels [3]. Extant literature on e-participation is replete with reference models. Relatively more cited among these works include: Dimensions of e-Participation Framework [4], Levels of Participation Model [5], Ladder of Online Participation [6], Behavior Chain Model [7], e-Participation Assessment Framework [8], e-Participation Evaluation Framework [9], e-Participation Exploitation Framework [10]. However these models show limited consideration for the implementation of the deliberation channel. This gap is further enlarged when considering spontaneous citizen political discussions on social media. Existing models are very abstract without sufficiently detailed conceptualization to support technical solutions directly. Therefore, existing models do not lend themselves to practical applications in developing technology support for political deliberation on traditional e-participation platforms and social media.

Due to lack of rigorous and scientifically grounded technology-mediated, political deliberation blueprints, e-participation designers intuitively develop dedicated forums imitating popular WEB 2.0 mainstream forum solutions (like HUWY,¹

¹ <http://www.huwy.eu/vi>

U@MARENOSTRUM,² VIDI,³ WAVE,⁴ VOICES,⁵ Puzzled by Policy⁶), drawing from the wisdom and popularity of the consumer, and interest-groups discussion platforms. However, political deliberation is of very special nature and commercial solutions do not necessarily map directly to particular e-participation needs. Against this background and in line with Macintosh et al. in [11], we argue on the need for e-participation to support in particular direct inclusion, monitoring and engagement of citizens with spontaneous political discussions on social media as a fundamental condition for sustainable e-participation. This is reflected in our Integrated Model for e-Participation [12] (IMeP) derived from Giddens's Structuration Theory [13] and complemented by Dynamic Capabilities Theory [14,15] which supports the Duality of e-Participation. Based on the model, we developed a conceptualization for e-participation implemented as a formal Ontology for e-Participation. This core model describes e-participation comprehensively along the core perspectives – platform, project, and process. In this paper we focus on the technical aspect and refine the model to capture the key aspects of the technology-mediated political deliberation. In our approach, we considered state-of-the art models for deliberative argumentation and the Integrated Model for e-Participation to elicit a comprehensive list of technology-mediated, citizen-led political deliberation requirements. Next we align state-of-the art discussion information metadata models, and identify missing concepts. Finally, we present a deliberation ontology for citizen-led e-participation.

The developed semantic model enables detailed, standardised deliberation information descriptions, facilitating seamless knowledge exploration and interoperability between various e-participation platforms, external content linking as well as better understanding of the content among e-participation stakeholders.

Our major contribution is not limited to providing for the first time a comprehensive conceptualization and ontology for political deliberation, but also in supporting both government- and citizen-led e-participation.

1. Approach

This section describes how we conceptualize political deliberation in the context of the citizen-led participation. The conceptual framework is provided in Section 1.1 and methodology in Section 1.2.

1.1. Conceptual Framework

Our conceptual framework comprises three core elements: 1) Pepper's World Hypotheses defining generic views for deliberation domain ontological space analysis, 2) Argumentation in Deliberation Theory and 3) our Integrated Model for e-Participation.

While it is common to analyze conceptual space of a domain by answering common journalistic questions (5W1H) [16] as a template for generating domain specific aspects, we intend to use more fine-grained framework derived from Pepper's World Hypotheses [17]. Our choice of is premised on the fact that the Pepper's views are

²<http://www.uatmarenostrum.eu/>

³<http://www.vidi-project.eu/>

⁴<http://www.wave-project.eu/>

⁵<http://www.give-your-voice.eu/>

⁶<http://join.puzzledbypolicy.eu/>

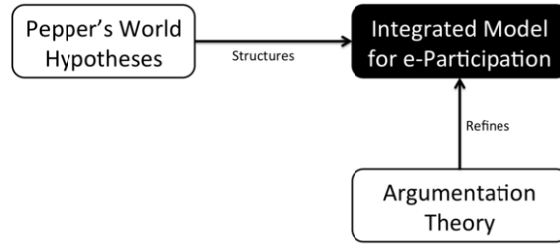


Figure 1. The Theoretical Framework Alignment.

metaphorically richer compared with the journalistic questions [18] as well that it can be mapped to the journalistic questions and Aristotle four causes. Moreover there is evidence of the suitability of applying Pepper's hypotheses for structuring and analyzing socio-technical systems [19]. Pepper identified four different adequate views of the world: Mechanism, Formism, Organicism and Contextualism [19,20] which in the context of e-participation deliberation, enable the specification of: deliberation goals to be realized through some staged models (Organicism); description of different entities involved in realizing a specified deliberation goals (Formism); the different functions, processes and tools required to produce desired e-deliberation outputs or outcomes (Mechanism); indication and evaluation of the experience of actors and observers of deliberation process (Contextualism).

We use the framework to create a theoretical grid (Fig. 1) for competency questions that we derive further from Integrated Model for e-Participation with deliberation part refined by Argumentation Theory. In 2009, Macintosh [11] identified the Duality of e-Participation as one of the key research gaps of the e-participation. The Integrated Model for e-Participation (IMeP) addresses the e-participation duality and is grounded in Structuration Theory and Dynamic Capabilities Theory. IMeP leverages two approaches to e-Participation: classic, Government-led e-Participation and the new, Citizen-led e-Participation. The two channels are exploited simultaneously to support the dynamic distribution of allocative and authoritative resources between citizens and decision makers in the context of decision or policy-making. Citizens given appropriate resources exercise their agency to participate in the social-system re-production. The legitimacy and significance of citizens' contribution to policy making and political deliberation is strengthened directly by government's acknowledgement, consideration and subsequent (partial) adoption. We have identified the following types of essential capabilities for realizing such integrated e-Participation framework: 1) adaptive capabilities including dynamic resources (re-) distribution and acquisition, rules re-production and reformation process; 2) absorptive capabilities including continuous deliberation monitoring process, deliberation shaping process, citizen information services; and 3) innovative capabilities including flexible monitoring process and ubiquitous e-participation. These capabilities ensure continuous reflexive dialogue and dialectics among citizens and between citizens and decision makers respectively characterizing the dual-nature e-participation process.

The OECD [21] put the active participation through deliberation as one of the core e-participation challenges while considering argumentation and engagement as the key aspects of deliberation. Argumentation theory is grounded in informal reasoning and

aims at developing ways of analyzing everyday conversation. According to the theory argument is an attempt to present evidence for a conclusion supported by particular premises (propositions or claims). Argumentative discussion, ideally of low persuasion should not assume particular deliberation results but the conclusions should rather evolve organically from a constructive discussion where participants convince others to their views [22]. According to Schneider [23] the arguments need to be identified, resolved, represented and stored, queried and presented to user. For this Schneider recalls fourteen most prominent reference models as a base for argumentation representation and exploration framework. We list models that we consider most relevant to political discussion requirements:

- **Toulmin** – model for legal, scientific and informal conversation arguments. All the claims supported by evidence or rules (warrants which can have a backing) can be qualified regarding certainty or rebutted.
- **IBIS** – Issue-Based Information Systems centers around issues that may have a form of a question. IBIS distinguishes three separate groups: participants in discussion, experts and decision-makers.
- **Walton's Critical Questions** – defines a set of critical questions aligned with the particular role addressing the points where the argument scheme may brake down. For example some questions defined can be: How credible is E as an expert source? Is E reliable?
- **Speech Act Theory** – a base for many argumentation conversations. Distinguishes five categories of speech acts: assertives (assumption), directives (order), commissives (vows), expressives (sentiment) and declaratives (enact what is said).

1.2. Methodology

A major goal of this work is to develop a comprehensive e-Participation Deliberation Model and a corresponding formal ontology. Our approach followed the three-staged Thalheim's construction workflow [24] (relevance stage, modeling stage, realization stage) as a best practice for model design and implementation process. Relevance Stage is represented by Section 2, Modeling Stage corresponds with Section 3 and Realization Stage is widely discussed in Section 3.2, 4 and 5.

In particular the questions for our enquiry include:

- R1. What are the key aspects of political deliberations on e-participation platforms?
- R2. What are the key Competency Questions for political deliberation conceptualization or ontology?
- R3. How to ensure the completeness of the Competency Questions?
- R4. What concepts can be elicited from the e-Participation Competency Questions?
- R5. How can the concepts be consolidated in a comprehensive deliberation model?
- R6. How can the model be leveraged for e-Participation deliberation cases?

Answering these questions based on the following steps:

1. *Knowledge Acquisition*: The Argumentation Theory and the Integrated Model for e-Participation provide a rich source of information on application domain

Table 1. Deliberation Competency Questions

Generic Views	Questions
Formism	CQ.3 Who are the deliberation actors? CQ.6 What are the deliberation claims? CQ.8 What are the topic arguments?
Mechanism	CQ.11 How deliberation is monitored? CQ.12 How deliberation is summarized? CQ.19 How actors are qualified? (credibility)
Organicism	CQ.20 What is the aim of the deliberation? CQ.23 What is the result of deliberation?
Contextualism	CQ.23 What are the deliberation performance measures?

essential for the relevance stage of the construction workflow. We followed the key model-properties and we aligned them in competency questions accordingly to the four views defined by the Pepper's World Hypotheses.

2. *Deliberation Concepts Elicitation*: Mapping the competency questions to specific political deliberation aspects entails determining which of the four generic views are addressed by the questions. The unique subjects and objects were selected as base-concepts. Relations between concepts were defined based on the common knowledge.
3. *Concept to Model Alignment*: After eliciting base-concepts and defining the relations we align the concept to the existing deliberation models.
4. *Ontology Creation*: After aligning base-concepts we use available tool (NEOLOGISM [25]) to graphically represent the concepts and relations in a form of a graph with re-using matching concepts by importing (referencing) existing ontologies. Finally we discuss the utility of the model on case study of existing e-participation initiative.

We argue for the reliability of our mapping based on the results of “*inter-observer*” and “*test-retest*” reliability tests [26].

2. Deliberation Conceptualization

This section develops a comprehensive deliberation domain conceptualization which supports the Duality of e-Participation. We elicit a set of relevant political deliberation competency questions from the Argumentation Theory based models and the Integrated Model for e-Participation (Fig. 2) and then align the questions to the four generic views derived from Pepper's World Hypotheses. Due to space limitation, we only present a subset of the competency questions in Table 1.

Having identified the key competency questions we elicit the core deliberation concepts presented in Table 2.

Due to space limitation, we list only few example concepts along with corresponding competency questions and relations between concepts. These conceptualizations are essential for the Thalheim's workflow-based deliberation model design. The concepts and relations presented in a way that can be directly mapped on the classes and properties of existing ontologies.

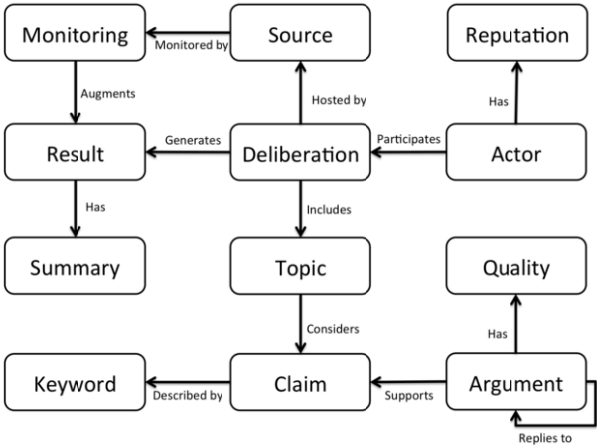


Figure 2. Deliberation Conceptual Model.

Table 2. Competency Questions To Concepts Mapping

Question ID	Concepts	Relations
CQ.5	Topic	Deliberation includes Topic
CQ.6	Claim	Topic has Claim
CQ.7	Keyword	Claim has Keyword
CQ.8	Argument	Claim has Argument
CQ.9	Conclusion	Topic has Conclusion

3. Deliberation Model

In this section we show the design and the implementation of the deliberation model, based on the concepts and relations defined in Section 3. First, we present a conceptual model for deliberation (Fig. 2) highlighting the overall scope and dependencies of the implemented end-model. The generic view is represented with most descriptive concepts only for better understanding of the model. It is clear from the elicited concepts that the central point for discussion on e-participation platforms (or spontaneous political discussions on social media) referred in the model, as a Source is Deliberation. By Deliberation we understand an argumentative discussion where every Post, belonging to particular Topic, is considered a Claim described by particular Keywords and should be supported by relevant evidence in a form of an Argument. Every Argument supplied by an Actor of particular Reputation has particular Quality measure (like relevance) assigned and can be backed or rebutted by other arguments. The Result of the Deliberation should be summarized to address the information overload issue and facilitate discussion exploration experience. The discussion Summary is augmented by extra information coming from Monitoring system mining and linking related information from external sources like other e-participation platforms and social media to ensure deliberation re-production and sustainability.

3.1. Deliberation Model Mission

The main purpose of the model is to provide e-participation platform designers and managers with relevant tool for structured and standardized representation of deliberation data and implicitly to support better e-participation experience for deliberation stakeholders. It is expected that more comprehensive data descriptions will contribute directly to better interoperability, easier data exchange and integration of information from various deliberation sources such as current e-participation platforms as well as social media. Moreover the unified, standardized, machine-readable representation will enable more coherent deliberation evaluation and comparison. The model supports coherent deliberation process design with emphasis on the key aspects essential for sustaining citizen-to-decision-maker dialog. In particular the model covers the Duality of e-Participation through seamless incorporation of spontaneous citizen-contributions on social media therefore significantly supports citizen-engagement as the key factor for e-participation initiative success. To our knowledge, no explicit deliberation ontology exist which comprehensively addresses the Duality of e-Participation. Here we acknowledge the work by Wimmer [27] which provides an ontology for e-participation research structuration and work by Belak [28] whose ontology tackles the deliberation as part of e-participation but focuses on the political aspects of deliberation with emphasis on particular case related to election and political agenda.

3.2. Deliberation Model Architecture and Implementation

Our goal is to implement the deliberation model in a formal ontology language such as RDF⁷ (Resource Description Framework) and OWL⁸ (Web Ontology Language). In line with best practice in ontology development, we attempt to re-use and extend existing and well-established ontologies to support our deliberation model. Thus, we identified key ontologies and align them to the deliberation conceptualization. Among prominent discussion and argumentation ontologies identified by Schneider are: IBIS – RDF (Interoperability in Business Information Systems – Resource Description Framework) [29], SALT (Semantically Annotated LaTeX for Scientific Publications) [30], DILIGENT [31] (DIStributed, Loosely-controlled and evolInG Engineering processes of oNTologies), Change Ontology (ChAO) [32], SIOC-Argumentation (Semantically Interlinked Online Communities) [33] and SWAN-SIOC (Semantic Web Applications in Neuromedicine) [34]. However, only SIOC with Argumentation module (drawing from IBIS and DILIGENT) offers sufficiently generic, domain independent, yet significant coverage for e-participation deliberation needs. The base SIOC⁹ ontology provides core concepts and properties to describe discussion information on the web. The ontology complemented by the Argumentation Module enables comprehensive argumentative discussion coverage for the general discussion case. Therefore in our paper we focus in particular on SIOC with Argumentation ontology as the base ontology and augment it with e-participation domain-specific concepts.

In Table 3 we present the elicited concepts aligned to SIOC and SIOC_ARG (SIOC Argumentation module) where a conceptual match occurs. The remaining concepts make the conceptual space for our deliberation ontology (DELIB). Due to space

⁷<http://www.w3.org/RDF/>

⁸<http://www.w3.org/2001/sw/wiki/OWL>

⁹<http://rdfs.org/sioc/spec/>

Table 3. Deliberation ontology alignment (selected examples)

Concept	Ontology	Representing Concept
Deliberation	SIOC	Forum
Source	SIOC	Site
Claim	SIOC_ARG	Statement
Argument	SIOC_ARG	Argument
Conclusion	SIOC_ARG	Position

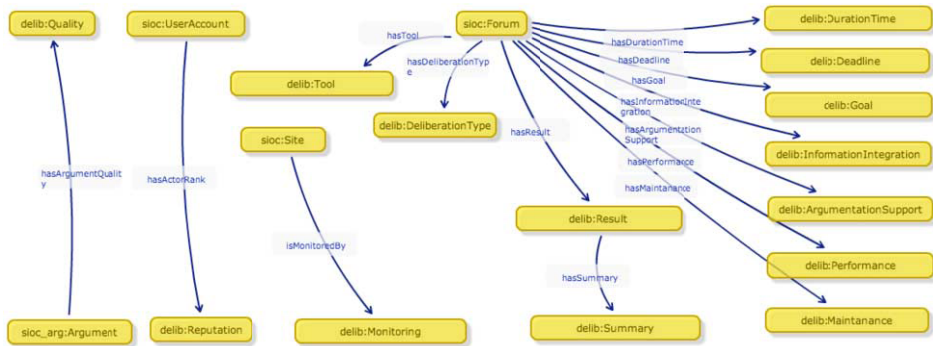


Figure 3. DELIB Ontology (without SIOC concepts).

constraints, we do not list all the mappings nor describe in detail the concepts and relations defined by SIOC Argumentation ontology. The final mapping enabled us to construct the e-Participation Deliberation Ontology (DELIB) (Fig. 3) based on web-ontologies best practice. To ensure clarity of presentation we focus only DELIB specific concepts leaving-out the concepts and relations covered by the base ontologies, nevertheless the full ontology representation can be provided if requested.

4. e-Participation Deliberation Model Use-Case

In order to illustrate how to apply the DELIB model; we employed the ontology created to structure and to describe real discussion data from a transportation e-participation initiative in an Irish city. Since the data mined from the dedicated WEB 2.0 forum does not contain the argumentative discussion structure, the descriptions had to be generated semi-automatically with manual categorization of claims and arguments. The ultimate use of the ontology assumes automatic content analysis and structuration accordingly to the DELIB ontology.

5. Validation

In this section we validate the implementation of the e-Participation Deliberation ontology. Our first argument for the validity of our ontological model with respect to the competency questions follows from the ontology construction process. Given that the ontology was generated from competency questions (through Thalheim’s construction

workflow), the question of whether the ontology answers the competency questions is trivially satisfied, i.e. the ontology is “correct by design”. Second, regarding the internal consistency of the DELIB ontology (expressed in RDF/OWL), we verified using the PROTÉGÉ Pellet Reasoner tool that the ontology is coherent or without contradiction. Third, the utility and practical relevance of the ontology was established through its use in encoding the deliberation information for a case-study of a transportation e-participation initiative.

6. Discussion

The DELIB ontology presented in this paper addresses the need for rigorous conceptual model and formal ontology to describe e-participation deliberation data. The semantic model construction process is rigorous and grounded in solid theoretical framework ensuring high validity of the presented model as a solution for coherent e-participation deliberation conceptualisation and as a tool for relevant, expressive and interoperable deliberation data representation. The rich conceptualisation with supports the argumentative nature of e-participation deliberation; Duality of e-Participation; seamless integration of external social media content along; and better alignment of discussion reproduction altogether better guarantees sustainable deliberation and increased citizen engagement. In principle the model enables better and more fine-grained deliberation content descriptions, more coherent information linking as well as facilitates the access, re-use and interoperability of the discussion information. DELIB ontology design has been validated and we have shown the utility of the solution. We cannot claim the absolute completeness of the presented semantic model although our ontology has been designed gradually around the Argumentation Theory and Integrated Model for e-Participation starting from the well-established models going towards dedicated implementation; therefore we claim better support of our model for dual e-Participation needs. As indicated in Section 4, we acknowledge the work by Wimmer [27] and Belak [28], nevertheless we argue on significantly different purpose of these ontologies in comparison to DELIB and we are not aware of any significant attempts at addressing the conceptualisation of e-participation deliberation with support for the Duality of e-Participation.

7. Conclusion

Motivated by the need to provide the necessary step towards conceptualising e-participation duality-enabled deliberation, we have presented a Deliberation Ontology for e-Participation. Results from our work show immediate opportunities for consolidating and sharing data from deliberative discourses available on both dedicated e-participation platforms and social media. As next steps, we intend to create an e-participation discussion knowledge base by mining information from e-participation platforms and social media and representing the structured content in a form of a common RDF knowledge graph with our ontology. Further steps include more real-life, case-based evaluations of the ontology, possible extensions.

Acknowledgement

The work presented in this paper has been funded in part by Eurapp.

References

- [1] O. Sabo, J. Rose, and L. Skiftenesflak, "The shape of eParticipation: Characterizing an emerging research area," *Gov. Inf. Q.*, vol. 25, no. 3, pp. 400–428, Jul. 2008.
- [2] A. Chadwick, "Bringing E-Democracy Back In: Why it Matters for Future Research on E-Governance," *Soc. Sci. Comput. Rev.*, vol. 21, no. 4, pp. 443–455, Nov. 2003.
- [3] J.A.G.M. Van Dijk, "Models of Democracy and Concepts of Communication," 2000.
- [4] A. Macintosh, "Characterizing e-participation in policy-making," *37th Annu. Hawaii Int. Conf. Syst. Sci. 2004. Proc.*, p. 10, 2004.
- [5] DESA, "UN Global E-government Readiness Report 2005 From E-government to E-inclusion," 2005.
- [6] C. Li and J. Bernoff, "Social Technographics ® TRENDS," *Forrester*, 2007.
- [7] B.J. Fogg and D. Eckles, "The Behavior Chain for Online Participation: How Successful Web Services Structure Persuasion," pp. 199–209, 2007.
- [8] E. Tambouris, N. Liotas, and K. Tarabanis, "A Framework for Assessing eParticipation Projects and Tools," in *40th Hawaii International Conference on System Sciences – 2007*, 2007, pp. 1–10.
- [9] A. Macintosh, "Towards an Evaluation Framework for eParticipation," *Transform. Gov. People, Process Policy*, vol. 2, 2008.
- [10] C.W. Phang and A. Kankanhalli, "A framework of ICT exploitation for e-participation initiatives," *Commun. ACM*, vol. 51, no. 12, p. 128, Dec. 2008.
- [11] A. Macintosh, S. Coleman, and A. Schneeberger, "eParticipation: The Research Gaps," pp. 1–11, 2009.
- [12] L. Porwol, A. Ojo, and J. Breslin, "On The Duality of E-Participation – Towards a foundation for Citizen-Led Participation," in *2nd Joint International Conference on Electronic Government and the Information Systems Perspective and International Conference on Electronic Democracy*, 2013.
- [13] A. Giddens, "The Constitution of Society: Outline of the Theory of Structuration," 1984.
- [14] D.J. Teece, G. Pisano, A. Shuen, and A.M.Y. Shuen, "Dynamic Capabilities and Strategic Management," vol. 18, no. 7, pp. 509–533, 1997.
- [15] C.L. Wang, "Dynamic Capabilities: A Review and Research Agenda Dynamic Capabilities: A Review and Research Agenda," vol. 9, no. 2007, pp. 31–51, 2007.
- [16] J. Yates and W. Orlikowski, "Genre Systems: Structuring Interaction through Communicative Norms," *J. Bus. Commun.*, vol. 39, no. 1, pp. 13–35, Jan. 2002.
- [17] S.C. Pepper, *World hypotheses, a study in evidence*, Univ of California Press, 1957.
- [18] T. Lombrozo, "The structure and function of explanations," *Trends Cogn. Sci.*, vol. 10, no. 10, pp. 464–70, Oct. 2006.
- [19] D. Marca and C. McGowan, "Specification Approaches Express Different World hypotheses," in *Proceedings of the Seventh International Workshop on Software Specification and Design, 1993*, 1993, pp. 214–223.
- [20] S.C. Hayes, L.J. Hayes, and H.W. Reese, "Finding the Philosophical Core: A Review of Stephen C. Pepper's World Hypotheses: A Study in Evidence," *J. Exp. Anal. Behav.*, vol. 1, no. 1, pp. 97–111, 1988.
- [21] OECD, "Promise and Problems of E-Democracy," *OECD*, 2004.
- [22] L. Groarke, "Informal logic," *The Stanford Encyclopedia of Philosophy*, 2014.
- [23] J. Schneider, T. Groza, and A. Passant, "A Review of Argumentation for the Social Semantic Web," *Semant. Web, IOS Press*, vol. 0, no. 0, pp. 1–62, 2011.
- [24] B. Thalheim, "The Science of Conceptual Modelling," pp. 12–26, 2011.
- [25] T.H. Chris Bizer, R. Cyganiak, "How to Publish Linked Data on the Web," 2007.
- [26] H.R. Bernard, *Social Research Methods – Qualitative and Quantitative Approaches*, SAGE Publications, Inc., 2000, p. 659.
- [27] M.a. Wimmer, "Ontology for an e-participation virtual resource centre," *Proc. 1st Int. Conf. Theory Pract. Electron. Gov. – ICEGOV'07*, p. 89, 2007.
- [28] V.S. Vaclav Belak, "Supporting Self-Organization in Politics by the Semantic Web Technologies," *Politics*, pp. 1–8, 2010.
- [29] A. Bouzeghoub, A. Elbyed, G.E.T. Int, and C. Fourier, "Ontology Mapping for Web-Based Educational Systems Interoperability," vol. 1, no. 1, pp. 73–84, 2006.

- [30] T. Groza, S. Handschuh, and M. Knud, "SALT – Semantically Annotated L TEX for Scientific Publications," pp. 518–532, 2007.
- [31] C. Tempich, H.S. Pinto, Y. Sure, and S. Staab, "An Argumentation Ontology for Distributed , Loosely-controlled and evolvinG Engineering processes of oNTologies (DILIGENT)," pp. 241–256, 2005.
- [32] N.F. Noy, A. Chugh, W. Liu, and M.A. Musen, "A Framework for Ontology Evolution in Collaborative Environments."
- [33] C. Lange, U. Boj, T. Groza, J.G. Breslin, and S. Handschuh, "Expressing Argumentative Discussions in Social Media Sites," *Soc. Data Web*, 2008.
- [34] A. Passant, P. Ciccarese, J.G. Breslin, and T. Clark, "SWAN/SIOC : Aligning Scientific Discourse Representation and Social Semantics."

EGOV 2014

This page intentionally left blank

Stakeholders, Participation and Voting

This page intentionally left blank

Rationality of Internet Voting in Estonia

Meelis KITSING¹

Estonian Business School, Tallinn, Estonia

meelis.kitsing@ebs.ee

Abstract. This paper discusses internet voting in Estonia on the basis of rational choice perspectives. It emphasizes particularly the importance of “bounded rationality” with emphasis on the Estonia – specific context in understanding the adoption of internet voting in the last seven elections. The key to the adoption process has been diffusion of ID card, which crucial for using wide range of online services offered by private and public sector organizations. Despite constantly increasing turnout the nature of internet voting is transactional. It has not made substantial contribution to online democratic participation other than making voting more convenient for certain segments of society.

Keywords. Internet voting, electronic voting, remote electronic voting, Estonia, rationality of voting, voting process

Introduction

Estonia is only country in the world where citizens have voted online in the municipal, national and European elections. The internet voting² is not just one unique initiative that makes Estonia to stand out. Its citizens have used internet banking since 1996, submitted their online tax declarations since 2000, bought bus tickets with their mobile phones for many years and done various other remote electronic transactions for a long time that have not been available in many parts of the world. This paper explores how these different online services provided by both public and private sector have contributed to the spread of internet voting in Estonia. It analyzes the government voting initiative in order to see whether it is primarily transactional mimicking “services first, democracy later” type of thinking or does it give an indication that the government has gone beyond “fallacy of electoralism” by managing to engage citizens in a substantial way. The paper describes key elements of the internet voting process, highlights different factors affecting internet voting turnout and the distributional impacts on the basis of insights from rational choice theories.

Estonia’s pioneering use of internet voting is particularly remarkable in the context of its heritage. While being a middle-income former socialist country, many studies on e-government cluster Estonia together with wealthiest countries in Europe and the world. Indeed, the UN E-Government Survey 2008 ranked it 13th in the world and compared Estonia with the Nordic countries, not with the ex-socialist countries [1]. If

¹Estonian Business School, Lauteri 3, 10114 Tallinn, Estonia.

²This paper uses terms internet voting, online voting, electronic voting, e-voting and remote electronic voting for the same concept which is remote electronic voting to cast one’s vote over the internet. It is different from electronic voting, which may take place at the polling station or may simply refer to counting votes electronically.

Estonia is placed into the context of Central and Eastern European countries with similar levels of per capita Gross Domestic Product (GDP) and socialist heritage it is the undisputed e-government leader. The paper starts by discussing theoretical framework. Then it will highlight key characteristics of internet voting in the last seven elections from 2005 to 2014. After that the paper will analyze the reasons for voting online as well as the distributional impact of internet voting. The paper concludes by highlighting key findings.

1. Theoretical Framework

The theoretical framework is not based on emerging literature on internet voting and/or e-government. It approaches internet voting as one form of voting on the basis on rational choice perspectives. The key argument of the paper is that the literature on internet voting can benefit from incorporation of insights from the literature on “traditional voting”. As the paper is concerned with the rationality of internet voting, then rational choice can be an obvious choice as a starting point. The arguments put forth by other schools of thought and the literature on internet voting can be assessed in the future research. Certainly this limits the scope of this paper as the rationality for remote electronic voting can be assessed from a variety of perspectives both conceptually and empirically. However, since the arguments for electronic voting are essentially instrumentalist, then conceptually it would be best assess them on the grounds of same instrumentalist logic on the basis rational choice schools of thought.

The instrumentalist view of voting assumes that a key barrier for low turnout is cost faced by individual voter. This assumes that individuals are self-interested utility-maximizers or at minimum act according to their preferences, who engage in cost-benefit analysis in the voting process. Following philosopher Joel Feinberg this notion could be labeled as “psychological egoism-based” approach to voting behavior [2]. However, if we assume that individual voter is self-interested in this manner, then the best way to minimize costs would be not to vote at all. One vote will not change the outcome [3]. Hence, whatever benefits outcome of elections will deliver will be the same regardless whether one vote is submitted or not. Reduction of transaction costs and increasing efficiency of voting process delivered by the availability of remote electronic voting will not change this calculation. Any kind of voting – online or offline – will still imply cost for individual voter however insignificant it may or may not be. Nevertheless, this Olsonian interpretation of rationality fails to address the question why such large segments of population in most democracies still vote. The behavior of 50–60 percent of population is seen as irrational on the basis of this approach. The Olsonian approach to rational choice is not useful model for empirical analysis.

Most importantly, the motivation of individual voter do not necessarily stem from the outcome of elections but rather from the voting process. Self-interested voter may maximize utility by acting on the basis of the sense of civic duty. If community and friends consider voting important, then participation in the elections delivers benefits related to a social standing. Indeed, rational choice literature, for example, has demonstrated that citizens may cast a vote simply because of a personal need which is not material, sense of civic duty which makes them feel good and reputational gains as others see them in the voting booth [4]. In other words, it may be rational to vote in a particular institutional context. Thus the act of voting cannot be analyze on the basis of

universal rationality but rather on the basis of contextual or bounded rationality.³ There is a rich body of literature which sees the rationality as something to be understood only in a specific context [5,6]. It is useless to argue whether people are rational or irrational because rationality is not absolutist concept. The emphasis has to be on different degrees of rationality. For instance, some people may vote simply over the internet because they perceive it as innovative, they may want to try it or because they have read about in media.

Approaching the rationality of internet voting on the basis of particular context, the benefit of reduced transaction costs⁴ in casting a vote through electronic means may be offset by the cost of not being able to show to others the act of voting – e.g. the fulfillment of civic duty. Thus if participation in the process is important, then remote electronic voting has opposite effect. It does not allow demonstrating participation in the voting process to a peer-group. Electronic voting is all about cutting the time spent for voting ritual. Bounded rationality may also imply that voter's motivation comes from imperfect knowledge and understanding of voting process. Individual voter may believe that one vote matters – even if it does not. Voters have imperfect information which may imply that they might be misled about the importance of voting [7,8]. However, assumption of “rational ignorance” would not lead to increased turnout resulting from electronic voting. Voters who vote anyway may change the method of voting from offline to online but it does not affect turnout.

The rationale for internet voting cannot come from a calculative singular approach where we assume perfect rationality and utility maximization. Voters have many different identities and they have multitude of preferences. Some voters may be encouraged to vote simply because remote electronic voting is available. This does not imply that they will vote next time. For many others the availability of remote electronic voting is not even necessary (not to mention sufficient) condition for submitting their vote. Hence, we should assume “bounded rationality” instead of perfect rationality when approaching theoretically and analyzing empirically remote electronic voting [5]. Electronic voting might be a good substitute for offline alternatives for some people but certainly not for everybody. From purely theoretical grounds it is difficult to see how the remote electronic voting contributes to increased turnout. Hence, the instrumentalist case that making voting convenient will contribute to increased turnout does not hold on the grounds of instrumentalist logic.

The next chapter applies these theoretical insights to the case of Estonia where internet voting has been used in the last seven elections. The discussion is based on data from the Estonian Electoral Commission and secondary sources. The research method is descriptive and do not offer any causal analysis. By providing descriptive statistics on the internet voting from 2005 to 2014, the research highlights key characteristics of internet voting and elaborates on data on the basis of rational choice framework.

³Bounded rationality refers to individual rationality which is limited by context within which individuals make decisions and operate. Imperfect information, resources, formal rules, social norms, interactions with others, uncertainty and dependence on previous choices are factors that limit the rationality of individuals.

⁴Transaction costs: any kind of undertaking involves costs that are higher than zero. These costs stem from searching information, uncertainty about outcomes, formal and informal rules in a particular environment. The concept of transaction costs is linked with bounded rationality (see above). Notion of perfect rationality would assume that transaction costs are zero while bounded rationality implies that transaction costs are always higher than zero.

Table 1. Turnout and Internet Voting in the Estonian Elections (2005–2014)

Type of elections	Date	E-votes (% of all votes)	Turnout (%)	E-voting turnout (% of all eligible voters)
Municipal elections	October 2005	1.8	47.4	0.9
Parliamentary elections	April 2007	5.4	62	3.4
European Parliament	June 2009	14.7	43.9	6.5
Municipal elections	October 2009	15.7	60.6	9.5
Parliamentary elections	March 2011	24.3	63.5	15.4
Municipal elections	October 2013	21.2	58	12.3
European Parliament	May 2014	31.3	36.5	11.4

Source: Composed by the author on the basis of data from the Estonian Electoral Commission [11]

2. Internet Voting in Estonia

Internet voting is the most well-known initiative to engage public in democratic process in Estonia. As Estonia is the only country in the world where citizens have voted online in the municipal, national and European elections, then the internet voting in Estonia has received a considerable scholarly attention [9,10]. Particularly, the 2007 parliamentary elections have been scrutinized from various angles. This section offers an overview of last seven elections, highlights key elements of voting process and discusses the main characteristics of internet voting in Estonia.

The possibility to vote online was first used in October 2005 when almost two percent of all voters, which translates into one percent of the electorate, used this opportunity in the municipal elections (Table 1). This experiment was followed the parliamentary elections in April 2007 where about 5 percent of casted votes were submitted online. In June 2009, the European Parliament Elections were held where close to 15 percent of votes were submitted online. In the last municipal elections in October 2009 almost 16 percent of the votes were casted online. The parliamentary elections of 2011 achieved a new record where over 24 percent of votes were submitted online. The municipal elections of 2013 saw somewhat lower turnout of internet voters – slightly over 21 percent. However, the latter should be compared with the municipal elections where obviously it is the best turnout of internet voters as well as offline voters among the last three municipal elections. In the European Parliament elections of May 2014 over 31 percent of votes were submitted online – although the overall turnout was lowest at 36.5 percent of last seven elections.

The core idea behind the Estonian internet voting system is that the provision of these online channels for voting removes another barrier by making voting more “convenient” [9]. Proponents of remote electronic voting in Estonia, however, often extend their argument beyond convenience and insist that this type of voting will increase turnout in elections. Electronic voting will reduce transaction costs and enhance efficiency in the voting process. Citizens find it easier to cast their vote and they face lower costs of voting. Of course, benefits of electronic voting such as reduced transaction costs are only one side of the coin. On the other side, the electronic voting has also costs – e.g. reduced civic engagement, privacy and security concerns. Indeed, these costs are not just technical or emerge from a particular civic republican and/or communitarian theoretical perspective. In order to comprehend costs and benefits of internet voting, the the next parts describe the internet voting process.

2.1. The Estonian ID-Card

Starting with the consideration of instrumental facts, internet voting reduces some transaction costs for voting while it increases some others. From a purely practical point of view, voters do not simply need access to the computer but the use of national ID-card is required as well. The use of ID-card requires a purchase of ID-card reader. Cheaper versions of the reader can be purchased for slightly less than \$10 dollars. More expensive versions can cost \$40–50 dollars. The ID-card itself costs slightly more than \$20 dollars. Certainly, the ID card is not only necessary for online voting but can be used of a variety of online services provided by public and private sectors. In addition, the ID-card can be used as a regular identification document within Estonia and it serves as a substitute for passport for traveling within the 27- countries of the European Union.

One reason why the government introduced ID-cards in 2002 was to provide a more secure and sophisticated substitute for online identification method provided by the Internet banking, where cards with numerical codes were used. Even though government has issued half million ID-cards by March 2005, the new identification method did not gain immediately considerable following in the online environments [12]. People used these cards primarily off-line. The bank-issued cards have been used in parallel and before the ID-card as an identification method for government provided online services. In recent years banks have actively supported the use of ID cards in Internet banking by lowering the amount of daily transactions that can be made by older Internet bank identification methods and also charging smaller fees for transactions made with the ID-cards.

However, these are more recent developments which build on the initial success of identification method used by the banking sector, which became an influential IT innovator by introducing internet banking in 1996 [13]. The quality, security and simplicity of its service attracted the majority of internet users as its customers. Already in 2002, 57 percent of Estonian internet users used internet banking. This service classified as the third most important reason for internet use, behind communicating via email (76 percent) and using search engines (62 percent) [13]. Many state agencies started to use the identification verification system used in internet banking, thereby enabling government services to work online. Since 2000 Estonians have been able to file their taxes online, using the identification system offered by electronic banking services. The study on use of government online services conducted in 2002 already indicated then that the 48 percent of Estonian internet users pay for e-government services through the internet banking [14]. Other ways of using e-government services were less exploited by the people.

Since most people use banking services often, then it has created habit to make transactions online which has made adoption of ID-card and internet voting easier. It has been rational for the banks to cooperate with government because it allows reaping benefits from the Internet as a network good. Essentially, banks such as Hansapank (it was renamed Swedbank in 2008) became hubs in the network. Clients are able to access services of government agencies as well as other services provided by private sector with a few mouse clicks while being logged onto the online banking environment. Citizens accessing government agencies are directed to the websites of banks if it was necessary to identify his or her identity. It was rational for government agencies to rely on this solution and cooperation because it was efficient, secure, simple and kept costs minimal. Both Internet-banking based solutions as well as new ID-card avoided the

Table 2. Characteristics of Internet Voting in the Estonian Elections (2005–2014)

Type of elections	E-voters outside of Estonia (% of all e-voters/ number of countries)	Length of e-voting (days)	E-votes as share of all pre-election day votes (%)	Mobile ID users (% of all e-voters)	First time online ID-card users (%)
Municipal 2005	N/A	3	7.2	N/A	61
Parliamentary 2007	2/51	3	17.6	N/A	39
Euro. Parliament 2009	3/66	7	45.4	N/A	19
Municipal 2009	2.8/66	7	44	N/A	18.5
Parliamentary 2011	3.9/105	7	56.4	1.9	N/A
Municipal 2013	4.2/105	7	50.5	8.6	N/A
Euro. Parliament 2014	3.7/98	7	59.2	11.0	N/A

Source: Composed by the author on the basis of data from the Estonian Electoral Commission [11]

necessity to created different identification systems for private and public sector organizations. Most importantly, banks have considerable power to influence behavior through price discrimination, then banks have really been key drivers of the ID-card adoption process.

This context allows understanding the role of ID-card in the elections. Naturally, it follows that one of the main reasons for low participation in online voting in the municipal elections of fall 2005 is simply the fact that the online use of ID card was not widely spread. Many people did not use ID-card for online transactions because they used old identification techniques. As the Table 2 shows, 61 percent of all internet voters were first online ID card users in the 2005 elections. In the 2007 elections the first time online users of ID-card users made up 39 percent. Overall, only 25 000 ID card-owners used their cards online in 2006. In 2009 the number of online users of ID-card had increased ten-fold to about 250 000 [15]. Subsequently, the percentage of first time online ID-card users in the European elections dropped to 19 and in the municipal elections to 18.5.

Similarly, voters were able to use mobile ID instead of ID card in the last two elections. The data shows that in 2011 election only 1.9 percent of internet voters used mobile ID while in 2013 the percentage had increased to 8.6 and in 2014 to 11 percent. The mobile ID does not imply that people can vote on any mobile phone. Rather it is mobile phone based identification method alternative to ID card, which allows to submit votes and conduct transactions in online environments. In sum, the role of ID card and mobile ID demonstrate that internet voting is a typical adoption process as described by Rogers [15], where early adopters proved ID card as well as mobile ID a reliable way to submit votes and conduct transactions online. As a result increasingly higher percentage of voters have started to rely on these methods.

Coming back to costs and benefits, it is obvious that the adoption of ID-card and its reader did represent significant costs in the early voting experiments in 2005 and 2007. However, it does not represent significant costs for the considerable proportion of voters anymore as they have adopted this technology already as consumers. But the cost of ID-card and its reader represent only the surface of the iceberg. Any analysis of costs has to go beyond it and consider entire internet voting process.

2.2. Internet Voting Process

The voting procedure is relatively simple and less complicated than conducting transactions with government in some other online environments such as the business regis-

ter. The voter starts by inserting the ID-card into card reader and opening the webpage for voting (www.valmised.ee). Then the voter verifies his/her identity using the first four-digit personal identification number (PIN1) of ID-card. This number is given to voter when the card is issued together with PIN 2 and PUK code. Both PIN codes are used also for all other online transactions with the ID card that require digital signature. After entering the first PIN number the server checks whether the voter is eligible by using the data from the population register.

Once the eligibility is verified, the voter is shown the candidate list of the appropriate electoral district and can click on her/his choice which is encrypted. This decision has to be confirmed by inserting digital signature in the form of second five-digit PIN code (PIN 2). The submission of the vote concludes the process for individual voter. If the voter changes its mind, then there is a possibility of electronic re-vote: e-voters can cast their votes again electronically and in that case, their previous votes will be deleted. As far as privacy and security are concerned, then at the vote count, the voter's digital signature is removed. The members of the National Electoral Committee can together open the anonymous e-votes and count them.

Certainly, voters may experience difficulties in this otherwise straightforward process. Voters have different levels of sophistication in using internet, they have different computer skill levels, their computers may be configured differently and they may use software that is not always compatible with the ID-card reader. The practice in Estonia has shown that cheaper ID-card readers may be sometimes quite unreliable and not work properly with some browsers (such as Firefox and Google Chrome). Hence, the technology may create additional barrier for voting for some individuals rather than to move the barriers. It creates uncertainty as this way of voting may not always be reliable.

One way of tackling these challenges is to vote early and not to leave it for the last minute. While most people go to polls on Sundays, internet voting is spread over seven days (it used to be three days in 2005 and 2007). Hence, internet voters can cast their vote already six days before the elections. If any technical difficulties occur, there is sufficient time to solve these problems or vote in the traditional way at the ballot box. Table 2 shows that in the first two elections the share of internet votes as a percentage of all pre-election day votes ranged between 7 and 18 percent. At the same time, in the last five elections it ranged between 44 and 59 percent. The 7-day internet voting period has it made easier for voters to submit their votes and half of the voter prefer to do it early rather than on the last day. This is one way for tackling potential uncertainty which technology may sometimes cause. It also reduces the symbolic importance of election day and makes voting as a result more transactional.

Table 2 shows also that the percentage of internet votes is miniscule in comparison with votes submitted in Estonia. In 2013 only 4.2 percent of internet votes were submitted abroad which implies that less than six thousand people voted abroad. At the same time there are tens of thousands Estonians living in Finland, not to mention other countries. Municipal election may be a local affair which does not interest Estonians living abroad but the European Parliament elections and parliamentary elections interest them even less as only 2–4 percent of internet votes have been submitted outside of Estonia. Even though, number of countries from where Estonians submit their voters has increased from 51 in 2007 to 105 in 2013, internet voting is still a domestic matter as 96–98 percent of votes are submitted by residents of Estonia.

This fact alone brings attention back to the importance of context for explaining rationality of internet voting. It seems that this method of voting would serve best the

Estonians outside Estonia and would allow increasing turnout by making voting for them possible. However, the expat community has not been eager to pick up internet voting and it really gathers primarily for domestic audience who could without major difficulties vote also in the traditional voting booth. Particularly so by considering that a considerable amount of internet voters are urban and the distance to voting booths is smaller in urban locations than in the countryside. The votes of residents of two largest cities – Tallinn and Tartu – have amounted to 40–50 percent of all internet votes in the last six elections.

2.3. The Distributional Impact of Internet Voting

The qualities of ID-card reader, computer hardware and software as well as skill-level in using these technologies are important factors whether internet voting makes voting more easier to citizens or not. The role of resources and knowledge, of course, raise the issue of digital divide⁵ and its effects on internet voting in Estonia [10]. The segments of society with a lower income, and insufficient computer skills are less likely to cast their votes online than wealthier and better educated citizens.

One way to measure the impact of digital divide is to look at age structure of internet voters. 18–34 year olds made up 43 percent of all internet voters in 2005 and 44 percent in 2007. After that their share has been dropping and reached 36 percent in 2011. At the same time the share of over 55 year old voters was 15 percent in 2005 but has increased to 21 percent in 2011. The share of internet voters between 35 and 54 has stayed more or less constant in all six elections with slightly more than 40 percent. This does not indicate a significant divide considering that young are always eager to adopt new technologies while older generations tend to take a more conservative view. The dynamics show that the older generation is actually following the young in the adoption process.

The data on distributional impact of internet voting on different sexes is showing the same pattern. In 2005, 54 percent of internet voters were male and 46 percent were female. Their roles had been reversed by 2011 as 54 percent of internet voters were female and 46 percent were male.

By attempting to see the impact of internet voting on educational and economic criteria the distribution of votes between cities and rural areas can be used as a proxy. More than half of the votes were submitted in capital city of Tallinn and its surrounding Harju county in 2013, where the GDP per capita is highest in Estonia and people have the best education. However, if one considers that 60 per cent of Estonian GDP is generated in this region, then the distribution of votes does not seem distortive. If the second largest city Tartu and its surrounding county are added to the picture, then over 60 percent of internet votes were submitted in the two largest metropolitan areas. At the same time, voters in quite urbanized and industrialized county Ida-Virumaa in the north-east Estonia counted only four percent of internet votes in 2013. As non-citizen residents can vote in the municipal elections, then this low turnout cannot be explained by ineligibility. Rather, the internet voting has not been adopted among Russian speaking population to the extent it has spread among Estonian speakers.

⁵ Digital divide is situation where certain social groups have resources, skills and knowledge for utilization of information and communication technologies while other social groups lack these necessary preconditions for internet use. Digital divide may exist between countries and regions as well as within regions, countries, cities, towns and villages (for instance, see Norris 2001).

Table 3. Distribution of internet votes among political parties in the Estonian Elections (2005–2014)

Type of elections/Party	Reform (% of all e-votes)	IRL (% of all e-votes)	Center	Social democrats	Greens
Municipal 2005	33	18 + 10 ⁶	9	10	N/A
Parliamentary 2007	35	27	9	13	11
Euro. Parliament 2009 ⁷	20	17	11	10	3
Municipal 2009	25	23	15	11	2
Parliamentary 2011	37	25	10	18	4
Municipal 2013	22	26	9	15	N/A
Euro. Parliament 2014 ⁸	32	19	6	15	N/A

Source: Composed by the author on the basis of data from the Estonian Electoral Commission [11]

One way to analyze the distributional impact is to consider the influence of internet voting on political parties. Parties representing less fortunate segments of population are skeptical about the internet voting, while center-right parties were the main champions of the internet voting initiatives. However, Alvarez et al argue that the results of Estonian internet voting have not introduced socio-economic and political bias when controlling for other variables [9]. Nevertheless, their own data about the 2007 elections shows that only 9.1 percent of internet voters voted for the Center Party, which received 26.1 percent of overall votes. The Center Party is a populist, left of center political party, which represents older, more Russian-speaking and economically challenged segments of Estonian population than other main parties. Naturally, it might be that the supporters of this party have lower levels of computer skills and this is the reason for lower share of internet votes. Nevertheless, seeing skills as more important explanatory variable than socio-economic status is just a restatement of the argument.

It is clear that there is an uneven distribution of internet along the party lines (Table 3). For instance, Reform Party received 35 percent of internet votes while its total score was 28 percent of votes in 2007. Similarly, the IRL received 27 percent of internet votes in comparison with 18 percent of total votes. In other words, two main center-right parties received a total of 63 percent of internet votes, while their share of total votes was 46 percent. Both of these parties were actively pushing for the implementation of remote electronic voting and the results show clearly they have benefited more than other main parties. Similar pattern has been persistent also in all other elections between 2005 and 2014.

2.4. Turnout and Internet Voting

The previous discussion showed that the electorate of center-right parties used more internet voting than center-left parties. However, the crucial question is whether these gains came by increasing turnout or simply substituting internet voting for ballot-box. Alvarez et al argue on the basis of data from the 2007 parliamentary elections that online voting mobilized “more casual voters” [9]. They found that 11 per cent of online voters probably would not have or for sure would not have voted without this option. Similarly, Vassil found that 14 percent of internet voters would not have voted in the

⁶The IRL was two separate parties in 2005. Isamaliit (IL) got 18 percent of votes and Res Publica (RP) 10 percent of votes. In the next elections both parties had joined forces and were running as one party – Isamaa ja Res Publica Liit (IRL).

⁷Independent candidate Indrek Tarand received 32 percent of all internet votes. More than any political party in these elections.

⁸Independent candidate Indrek Tarand received 16 percent of all internet votes.

2007 parliamentary elections by other ways than internet [17]. Both of these studies relied on survey data which is of limited nature and cannot properly estimate substitution effects. In a methodologically more sophisticated approach Bochsler estimated the magnitude of substitution effect and found that the internet voting in 2007 elections did not lead to increased turnout, but attracted the same social groups who usually vote [10].

This outcome is consistent with the conceptual discussion provided in the theoretical framework, which holds that internet voting does not necessarily increase participation in the elections. In democracies, adult citizens can vote but large minorities or even majorities choose not to exercise this right even if the transaction costs are low. Similarly, internet voting may decrease transaction costs but does not necessarily increase participation. In many cases, it may simply serve as a substitute for citizens already actively engaged in political participation.

Nevertheless, the last results of municipal elections were correlated with increased participation. The turnout is unusually high for a municipal election, which seems to suggest that e-voting might have contributed for the increased participation. However, online voters made up almost 15 percent of voters also in the European Parliament elections, where the turnout was close to 44 percent. Of course, there are other factors at play such as economic issues and dissatisfaction with particular municipal governments in explaining the high turnout. Most importantly, the elections results are overdetermined and correlations do not imply causation. The data also suggests that older people and more women are using online voting option, which reveals that this method of voting is becoming more widespread and ordinary voters may simply use it as a substitute for offline options.

3. Conclusion

This descriptive analysis suggests that the internet voting is broadly consistent with the arguments presented by the rational choice school of thought. The internet voting has decreased transaction costs for those who for whatever reasons plan to vote anyway. The rationality can be explained on the basis of the specific context of Estonia rather than on the basis of universal rationality. This limits the lessons to be drawn to other countries from the Estonian experience.

Constantly increasing number of Estonians has used opportunities to vote online in the last six elections. The key element in encouraging the internet voting has been adoption of government issued ID cards by increasingly greater segments of Estonian society. As the ID card can be used in multiple offline and online environment, its widespread use in using both online services provided by public and private sectors has contributed to the internet voting turnout. Internet voting is primarily used by residents of Estonia, not by expats and institutional changes to increase voting period from three to seven days have encouraged adoption of internet voting.

The internet voting has a distributional impact on political parties as the center-right parties have higher share of internet votes than center-left parties. However, there is no strong evidence that internet voting has increased turnout and hence, it cannot be argued that it has reallocated votes among different parties. Even if internet voting may be reducing quality of democracy in Estonia by making voting purely transactional and benefited some groups more than others, it has not decreased the turnout in the elec-

tions. Most importantly, it has made voting more convenient for constantly increasing number of voters.

References

- [1] United Nations. *UN E-government survey 2008. From E-government to connected governance*. New York: United Nations, 2008.
- [2] J. Feinberg. Psychological egoism. In J. Feinberg and R. Shafer-Landau (Eds.), *Reason and responsibility: Readings in some basic problems of philosophy* (pp. 520–532). California: Thomson Wadsworth, (2008), 520–532.
- [3] M. Olson. *The logic of collective action; public goods and the theory of groups*. Cambridge, Mass.: Harvard University Press, 1965.
- [4] S. Merrill and B. Grofman. *A unified theory of voting: Directional and proximity spatial models*. Cambridge: Cambridge University Press, 1999.
- [5] H. Simon. A behavioral model of rational choice. *Quarterly Journal of Economics*, 69, (1955) 99–118.
- [6] D.C. Mueller. Rational egoism versus adaptive egoism as fundamental postulate for a descriptive theory of human behavior. *Public Choice*, 51(1), (1986), 3–23.
- [7] D. Moon. What you use depends on what you have: Information effects on the determinants of electoral choice. *American Politics Quarterly*, 18, (1990) 3–24.
- [8] D. Moon. What you use still depends on what you have: Information effects in presidential elections, 1972–1988. *American Politics Quarterly*, 20, (1992) 427–441.
- [9] R.M. Alvarez, T.E. Hall, and A.H. Trechsel. Internet voting in comparative perspective: The case of Estonia. *PS: Political Science and Politics*, 42(3), (2009), 497–505.
- [10] D. Bochsler. Can internet increase political participation? Remote electronic voting and turnout in the Estonian 2007 parliamentary elections. *Conference "Internet and Voting"*, Fiesole, Italy, 2010.
- [11] Estonian Electoral Commission. Elektroonilise hääletamise statistika. Retrieved June 10, 2014, from <http://www.vvk.ee/index.php?id=10610>.
- [12] E-User. E-government country brief: Estonia No. 8/2005. E-User: Public Online Services and User Orientation, 2005.
- [13] O. Lustsik. E-pangandus eestis: Kiire kasvu põhjused ja tegurid. *Kroon Ja Majandus*, 3, 2003
- [14] A. Krull. ICT infrastructure and E-readiness assessment report. Tallinn: Praxis Center for Policy Studies, 2003.
- [15] H. Rudi. E-valimised töid juurde 11 222 ID-kaardi kasutajat. *Postimees*, June 23, 2009.
- [16] E. Rogers. *The diffusion of innovations*. New York: The Free Press, 1995.
- [17] K. Vassil. E-valimistest osavõtmise kogemuse ja tegurid. E-valijate võrdlev analüüs 2005. Aasta ja 2007. Aasta riigikogu valimiste põhjal. Unpublished Masters, Tartu University, 2007.

Problematizing the Participatory Subject in Demands Driven Development of Public Sector

Katarina L. GIDLUND¹ and Johanna SEFYRIN
Mid Sweden University, Sundsvall, Sweden

Abstract. This paper concerns the construction of the individuals to whom public e-services are aimed, and who are expected to participate in demands driven development of public sector. The argument is that these individuals are differently positioned in relation to and have different prerequisites to participate in demands driven development processes, and that this has to be taken into account by practitioners who are working demands driven development of public sector. The aim of the paper is thus to address the need to acknowledge differences in individual users' possibilities to participate in the development of public sector through opening up and critically analyze categories indicating participants – e.g. 'users', 'citizens' or 'practitioners'. This is done through a discourse theoretical analysis of a text; the Swedish Guidelines for Demands Driven Development. The analysis of the text shows that the dominant category signifying a participatory subject is 'target group(s)', which is articulated according to four different themes. However, none of these themes articulates an unpacking of the category 'target group(s)', and the term is instead used to signify everyone as if these were alike and had the same prerequisites and possibilities to participate in demands driven development processes – in discourse theoretical terms 'target group(s)' works as an empty signifier. In this way differences between the individuals who are included in the category are hidden, and practitioners are left with no guidelines for how to deal with these.

Keywords. Participatory subject, demands driven development, public e-services, discourse analysis, empty signifier

Introduction

The concept of a participatory subject has reached an almost indisputable position in the design of information systems, and it is often claimed that the involvement of users is critical to the success of a system. Already in 1984 Ives and Olson [1] made a literature review touching upon user involvement and indicators of system success, and since then many others have followed [2–4]. As a result, a lot of effort has been invested in order to enhance the understanding of the participation of system users in information systems development processes. However, fewer texts have been devoted to address the construct of a participatory subject in itself; its different origins, translations, dimensions and implications, and the participating subject in the development of public e-services is no exception. The argument that will be put forth in the paper is that the individuals constituting participatory subjects are differently positioned in rela-

¹ Corresponding Author.

tion to and have different prerequisites to participate in demands driven development processes, and that this has to be taken into account by the practitioners who are implementing demands driven development of public sector. The paper aims at contributing to the field of demands driven development in public sector through providing a more nuanced discussion about the imagined participatory subject and its prerequisite to participate in the development of public sector.

In public sector there is currently a movement towards more cooperation with the citizens and businesses, primarily with regards to the development of public e-services [e.g. 5,6]. The expected benefit of a closer cooperation with citizens and businesses is to make public sector more efficient and to minimize costs. Related to this is also a fear that these actors do not use the e-services enough; “the majority of EU citizens are reluctant to use them [the public e-services]” [6]. Thus, there is a fear that the expected savings will not be realized and 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. The importance of a user presence is repeated over and over again in different shapes: involvement, empowerment, collaboration, flexible and personalized, user satisfaction etc. [6].

In information systems and related disciplines the concept of ‘users’ is generally used as a concept covering a range of participating subjects in a variety of contexts. This suggests that situated in and related to different contexts there are a vast number of articulations or constructions of participatory subjects, in terms of for instance ‘users’, or some other term indicating participatory subjects, e.g. practitioners [7], citizens or businesses. Hence, even though a single term is used, this term might include a multitude of heterogeneous participants who are differently positioned in relation to the information system at hand. Hence we argue that categories such as ‘users’ – are ‘done’ or constructed differently in different contextual settings. The construction of users – and hence participation – is done in several different ways, for instance in how some users and not others are invited into system development projects [8,9], in how users are invited into system development projects in early development phases and thus granted more influence, or later when most of the important decisions have already been made [10,11], or in how users are grouped into more or less large and representative groups [12]. The construction of users is also done in various texts such as policy documents and guidelines in which ‘users’, ‘citizens’ or some other category indicating participants are articulated in relation to specific expectations, values or activities.

However, if we are serious with demands driven development categories which indicate heterogeneous groups of actors, such as ‘users’, practitioners, citizens and businesses needs to be opened up and expanded in order to disclose the actors that are implicitly and explicitly included in these groups. Only then can we begin to discuss which individuals who are central in a specific design process, and make sure that some individuals are not left out. Furthermore the individuals that are included in such categories are differently situated in relation to the information system at hand, and have different prerequisites and possibilities to act and participate in the development of this. These differences might be described in terms of traditional sociological stratifications such as class, gender, age, ethnicity and so forth, but they might also be discussed in the form of those who have or do not have knowledge or access to technical language [13], or have enough time depending on family situation, work, gender etcetera. This problem is related to issues of representation and the possibility to accurately represent groups of individuals [12], but also to issues of access to information technologies [14], something which is however not within the scope of this paper. It is important that

there is an awareness about these issues among the politicians and practitioners dealing with the development of public e-services, and that there are methods for taking these issues into consideration. This is foremost a question of the expectations and handling of individual citizens and their participation; the situation with the participation of businesses is somewhat different since this is done within an organizational setting.

The paper aims to address the need to acknowledge differences in individual users' possibilities to participate in the development of public sector through opening up and critically analyze categories indicating participants – e.g. 'users', 'citizens' or 'practitioners'. This will be done through a discourse analysis of a specific text, in this case the Swedish Guidelines for Demands Driven Development [15]. Our point of departure is that participation and hence 'users' or participants are constructed in a variety of contextual settings, and our choice to analyze this particular text is motivated by the fact that in Sweden this is the main document that aims to provide practitioners in public sector with practical guidelines for how to involve and cooperate with citizens and businesses in the development of public sector. Hence this particular text constitutes a central Swedish example of a text in which the construction of participatory subjects is done, but it is not considered representative of the construction of participatory subjects in more general terms.

The paper is structured as follows; first, the theoretical points of departure are presented, constituted foremost by a discussion of the various prerequisites of individuals to participate in the development of public sector, and discourse theory which will be our analytical methodology. Second, the text (The Swedish Guidelines for Demands Driven Development) is presented shortly and the methodological procedure is given account for. Third the text is analyzed and discussed and finally, overall conclusions are made and impacts for practitioners in demands driven development of public sector are put forward.

1. Theoretical Points of Departure

The paper is based on a constructivist point of departure, and written in a critical tradition, which here means a focus on making visible and problematizing that which is taken for granted, especially in the form of knowledge practices such as the creation and reproduction of knowledge, truths and hegemonic discourses, and the consequences of these for various actors [16,17]. What is taken for granted and hence what could be understood as possible alternatives is different in different contexts, but here we are interested in critically exploring the idea of a participating subject, articulated through concepts such as 'users'.

Participatory subjects may have different prerequisites to participate in demands driven development, and there are many aspects of this issue. One predicament relates to practices of defining concepts and categories and the boundaries between these, something which is central in social life. Such practices are also central in disciplines such as sociology and information systems – in sociology in terms of categorizations of gender, age and class, and in information systems for instance in terms of the categories that are built into information systems [18,19]. However, the categorization of individuals are often problematic for several reasons, for instance when categories are based on limited knowledge and prejudice, this might lead to overly simplified and general categories, categories that the included individuals do not identify with and which thus fail to accurately represent these individuals, or categories which leave out

central actors, who thus become marginalized and made invisible [12,18,20,21]. This is related to the acknowledgement and inclusion of minorities. A related problem is the fact that any category is heterogeneous and multifaceted, and thus it is hard to talk about for instance 'women' or 'immigrants' as though these categories were consistent, and the individuals included in the category were homogeneous [12,20,21]. In the context of demands driven development also other aspects of individuals' different prerequisites for practicing participation are relevant. For instance in Participatory Design and information systems more generally it has for a long time been discussed how 'users' often do not have the same technical knowledge as 'designers', and thus might find it hard to formulate demands on a system under development [13,22]. In this case it is the question of a lack of technical know-how and language which makes it hard to participate and formulate demands in a specific design situation. In terms of knowledge about the Swedish social system this might also be a problem for some individuals to know and understand which of their demands that the public sector is obliged to meet. Furthermore individuals might hold different positions in terms of demanding fulfilment of their needs.

It is important to underscore that practices of defining categories are power related practices in which some actor(s) define other actor(s) as included in or excluded from categories [e.g. 20,21]. Categories often have concrete and sometimes severe consequences for those who are categorized, for instance when a homosexual refugee is not granted refugee status, but is instead sent back to a home country in which s/he will be persecuted as a sexual deviant. Categories are constructed and emerge and become meaningful in a specific situated social order – and some categories become taken for granted as truths and are viewed as self-evident rather than as constructed. These categories are repeatedly reproduced by various actors – and hence become more stable than others – even when they are problematic for those who are included therein, for instance the category 'parents', which includes a multiplicity of differently situated and heterogeneous individuals.

One way of critically analyzing what is taken for granted is through the use of discourse analysis, in which the point of departure is that dominant or marginalized discourses play a central role in the reproduction of the existing social orders, at the same time as they constitute an arena for the change of these. There are several ways of working with the concept of discourses [e.g. 23,24], and here we have chosen to work with discourse theory [24–26]. A general definition of discourses is that "a discourse is a specific way of speaking about and understanding the world (or a part of the world)" [24]. Hence discourse can be understood as a number of rules and taken for true conditions that act as rules and procedures that in some sense control human action, in terms of what is considered as true and what is considered as correct and doable in a specific context. With this definition a discourse is always part of a specific situated context, including social practices, and cannot be reduced to textual or linguistic practices. By including social practices the perspective is broadened and includes also the relations between language manifestations and the conditions and practices which enable these manifestations. Inherent in such an approach to discourse are different relations of power.

For the kind of reading we are interested in here we find several of the central concepts in discourse theory useful [24]. In accordance with Laclau and Mouffe [25,26] a discourse is a system of meanings in a specific domain [24]. A discourse can be understood as social life, and is not translatable as language practices such as speech or writing only, but includes all systems of signification [26]. This system of meanings is not

set once and for all, but is always moving, whereby the meaning of signs – or words, concepts, categories – are shifting. In this way, social phenomena are never set or closed, but instead meaning can never be finally permanent, something which opens up for social struggles over definitions of society and identity. Outside of a specific discourse there is “the discursive field” [25: 111], which is a reservoir of meanings which signs had or has in other discourses, but which are ignored in the specific discourse in order not to create disorder [24]. Within a specific discourse there are central, or privileged, signifiers (concepts or words) around which other signifiers are ordered and from which they gain meaning, for instance “the body” is central in medical discourse, and democracy in political discourse. These privileged signifiers are called *nodal points*. Furthermore, *moments* are signifiers within each discourse which are relatively stabilized, or closed, whereas *elements* are the signifiers which are not yet defined. However, moments are never completely defined or closed; there is always some instability; “the transition from ‘element’ to ‘moment’ is never completely finished” [25: 110]. Depending on position and influence different actors have different possibilities to reproduce and change existing discourses through acts of confirmation or change of the meanings of moments and nodal points. When several meanings hand are coupled with the same signifier without taking into consideration their possible intermediate complexity and the complexity seems to disappear inside the signifier the signifier is called an *empty signifier* [26]. Laclau [26: 106] (ibid.: 106) writes that an empty signifier “signifies a totality which is literally impossible. Seen from another angle, this is a hegemonic operation ... [in which] a certain particularity transforms its own body in the representation of an incommensurable totality”. An empty signifier is a term representing an assortment of differentiated particularities, which are not united by any common feature, but which are rather united only through the act naming, and hence creating a category.

With the help of the concepts *nodal point*, and *empty signifier* we will analyze the Swedish Guidelines for demands driven development [15], with a focus on articulations of central categories signifying participatory subjects in this specific text.

2. Empirical Case and Research Methodology

The policy document which constituted the empirical material for the analysis was the Swedish Guidelines for Demands Driven Development [15], a 69 pages long document working as the primary guidelines for practitioners in Swedish public sector organizations. The guidelines are published by the Swedish delegacy for electronic government (the E-Delegacy), and written by a working committee within the E-Delegacy. The text is divided into five main chapters, plus references and research, and an attachment about methods for how to explore the demands of target groups. The sections are: 1. About the guidelines (including for instance objective, goal, delimitations, explanations of terms, about the writers), 2. What is demands driven development? (including for instance demands as part of the development process, and basic principles for demands driven development), 3. Why is there a need for demands driven development?, 4. How is it done? (including how to get started, challenges and how to handle these, and a checklist for how to handle challenges), and 5. Examples. Our analysis includes the first four chapters, and covers pages one to forty two.

With the point of departure of the aim of the paper – to address the need to acknowledge differences in individual users' possibilities to participate in the development of public sector through opening up and critically analyze categories indicating participants – our guiding questions for the analysis were:

1. *What kind of categories indicating participatory subjects emerge in the text and how are these articulated in relation to other elements?*
2. *How are these categories articulated in order to make visible differences between the individuals included in the categories, and methods for dealing with these?*

The reading and analysis of this document took place in several steps. As a first step (question 1) we made a rather generous definition of participatory subject and individually searched for instances of these in the first 42 pages of the text, and marked each instance of a possible subject. After that we went through the text together, and discussed whether to include or exclude a specific instance. When discussing our initial reading, it soon became clear that it was not at all self-evident what a participating subject could be. However, the concept 'target group(s)' emerged as the most dominant one and appeared as a privileged signifier, or a nodal point. We then made a second individual reading, searching for how the term 'target group(s)' was used in the text; if and how it was combined with other terms, and in what context it appeared. In doing this we marked the whole sentences in which the term target group(s) was used, something which resulted in themes of articulations. More specifically we searched for how 'target group(s)' was related to actions, practices and contexts. Finally (question 2) we searched for articulations of differences and nuances of the nodal point within these themes.

3. Analysis

In the analysis we will first present the analysis of the text in terms of how in the text there are articulations of a participating subject in relation to demands driven development of public sector. Second, we identify themes of articulations, and third we focus on how differences in the articulations of participatory subjects.

3.1. *Articulations of a Participatory Subject*

The actor in focus and hence privileged signifier (i.e. participatory subject) in the guidelines for demands driven development seemed to be the term 'target group(s)' (in some form or other; the target group(s), target group(s)). Our first analytical question was: *What kind of categories indicating participatory subjects emerge in the text and how are these articulated in relation to other elements?* Starting out from this we searched for how this nodal point was articulated, first by the obvious search for definitions. One of these definitions showed how in the text 'target group' was articulated as "a defined group which is interesting as recipients or dialogue part" (p. 8). It was also stated that "Public agencies, municipalities and county councils have different names for the persons, groups or organizations that they exist for or address. It can be the general public, inhabitants, citizens, users, customers, clients, other organizations, target groups and so forth" (p. 8). Second, we searched for articulations in the form of contextual themes, i.e. how this nodal point was related to other elements in the text such as

actions, practices and contexts. When analysing the sentences including the term target group(s), several themes for how the term was used could be discerned.

One theme (A) was about identifying, catching, mapping, finding out, put in focus, know about demands of the 'target group(s)'. This theme was the most common, and examples are the following quotes:

- "find out the demands of the target groups ... have knowledge about the target group ... catch, understand and in development integrate the demands of a target group" (p. 5)
- "put the target group in focus ... meet the demands that target groups' experience" (p. 7)
- "knowledge about the target group's behaviour ... the mapping of the target groups' demands" (p. 10)
- "having competence and knowledge of the target group ... remind about the target group's perspective" (p. 19)
- "catch the demands of an identified target group" (p. 22)
- "identification of target group ... reach the target group" (p. 39)

Another theme (B) concerned the cooperation with the target group(s), and here it was about involving the target group(s), being in contact with the target group(s), communicate with them and so forth:

- "involve the target group continuously ... recurring contacts with the target group ... simplify target groups' everyday lives ... meaning that the target group will be involved and become active" (p. 11)
- "let the target groups become more involved ... which demands the target group has ... the target groups are relatively passive ... the target group is active and participating" (p. 12)
- "cooperate with the target group" (p. 21)
- "involve the target group in the development" (p. 40)

A third theme (C) concerned the fulfilment of the demands of the target group, and how services might create benefit for target groups and public sector organizations. Examples are the following quotes:

- "produce services that fulfil target groups' demands" (p. 4)
- "the demands of the organization/organizations as well as the target group" (p. 17)
- "if the target group does not use the service" (p. 22)
- "which problems a specific target group has ... when the target group or the agency benefits from a service" (p. 40)

The final theme (D) concerned how to handle the target group in terms of their size and composition. This theme was the only one that in some sense touched upon the problem of how to deal with the fact that the 'target group(s)' is in no way homogeneous, and this was done through a focus on how to find representatives for the target group(s):

- "having too large target groups ... try instead to segment the target groups" (p. 16)

- “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 entire target group” (p. 20)
- “the composition of the target group” (p. 25)

To find, to focus on, to map, to catch, and to identify are articulations that are formed around the notion that ‘target group(s)’ as a category in a self-evident way exist ‘out there’ and is possible to identify, communicate and cooperate with. These articulations indicate a belief that there are already predefined groups constituted by representative individuals that can be communicated with. Creating benefits, deliver in line with demands, and fulfil demands are also articulations circling around the idea that it is possible to interact with an existing target group. These themes seem to naturalize the idea of the ‘target group(s)’ since neither of them question the idea of an existing, or easy to ‘find’, target group. The fourth one however differ to some extent since it in some sense opens up and questions the taken for grantedness of the category, in terms of size, composition, and representativity of the included individuals.

3.2. The Target Group as an Empty Signifier

The second analytical question was: – How are these categories articulated in order to make visible and practically handle differences between the individuals included in the categories? In relation to this question the analysis makes visible that the privileged signifier ‘target group’ was rather poorly nuanced, questioned or problematized – other than very shortly in terms of size, composition, and representativity of the included individuals. Even though the privileged signifier ‘target group’ is a generalized category in which a multiplicity of different actors is included, the differences are not touched upon. There were no articulations of how to the risk that categories might be structured by biased assumptions of who to be identified. There were no articulations of how to handle the fact that individuals might not hold equal possibilities to act as participants – in terms of abilities to formulate their needs or to understand that they do have needs that the public sector are obliged to meet. There were no articulations about the possibility that the participants might hold different positions in terms of demanding fulfilment, and there were also no articulations of how to identify and include minority groups.

On the contrary, ‘target group’ was used without any efforts of deconstruction or problematizations, and the readers and users of the guidelines seemed to be expected to fully understand and grasp the concept of ‘target group(s)’ and also be able to communicate this to other practitioners. Hence it was not discussed who might be included in the category ‘target group(s)’; if these might be old, young, women, men, transsexuals, homosexuals, working class, middle class, in the midst of making a career or at home with a newborn child and with the main responsibility of home and children, born and raised in Sweden or came to Sweden from Syria only three months ago, with a university degree in electrical engineering or with a degree from junior high school and with poor knowledge in Swedish language. A broad and inclusive category such as ‘target group(s)’ might include all of these, but this is not made visible in the guidelines, and it is not discussed how such a heterogeneous category might be practically dealt with.

In discourse theoretical terms the category seemed to work as an empty signifier which included every possible participatory subject without taking into consideration their possible intermediate complexity. The complexity seems to disappear inside the

signifier and the signifier is as such labelled an empty signifier [26]. In this case the most apparent hidden complexity is that of power and its linkages to biases and different prerequisites and possibilities to participate. 'To be identified' places the participatory subject in a very passive position, the participatory subjects might hold unequal possibilities and affordances 'to be involved' and 'to express demands', and inside the articulations of 'size' of the target group are the reduced possibilities of representation for minority groups.

4. Discussion and Conclusions

We have used a discourse theoretical framework to explore how participatory subjects are articulated in a specific text (the Swedish Guidelines or Demands Driven Development). We found a privileged signifier – 'target group(s)' – and analyzed how this category was articulated in relation to other signifiers in the text. In this analysis we found several themes which were related to 'catching' and 'involving' the target group(s), and to 'goal fulfilment', and 'size-management' of the target group(s). The analysis showed that the category 'target group(s)' was used in order to deal with the multitude of heterogeneous individuals that public sector are faced with when developing public e-services with a demands driven agenda. However, concealed in the category of 'target group(s)' were several complexities; the passive position of being identified, the unequal possibilities and affordances of 'being involved' and 'expressing demands', and making invisible minority groups. Consequently the category hides several of the complexities of participation, and can in discourse theoretical terms be understood as an empty signifier. What is hidden behind the signifier of 'target group(s)' are power relations and social orders, the power to categorize and the position of being categorized, or being left out of existing categories [20]. Also made invisible is the fact that possible participants in demands driven development of public sector have different prerequisites to participate. When these heterogeneities are not touched upon they remain hidden and the possibility to analyse the complexities and also to create methods and tools for how to deal with them are lost. The use of the concept 'empty signifier' makes it possible to address this as an active black-boxing of differences in position and power relations that takes place through the use of the term 'target group(s)'. Through identifying 'target group(s)' as an empty signifier it becomes possible to open up the box and make visible and nuance their differential positions and prerequisites in relation to demands driven development practices. Doing this would greatly increase the possibilities for the practitioners to make use of the Guidelines in their work with making demands driven development happen.

References

- [1] Ives, B., & Olson, M.H., 1984, User Involvement and MIS Success: A Review of Research, *Management Science*, 30(5), 585–603.
- [2] Kappelman, L.A., & E.R. McLean, 1991, The respective roles of user participation and user involvement in information system implementation success, *Proceedings of the International Conference on Information Systems*, 339–349.
- [3] Hartwick, J., & Barki, H., 1994, Explaining the Role of User Participation in Information System Use, *Management Science*, 40(4), 440–465.

- [4] Iivari, J., & Igbaria, M., 1997, Determinants of user participation: a Finnish survey, *Behaviour & Information Technology*, 16(2), 111–121.
- [5] Ministerial Declaration on eGovernment, 2009.
- [6] European eGovernment Action Plan 2011–2015.
- [7] Brereton, M., 2009, Design from Somewhere – A Located, Relational and Transformative View of Design, in Thomas Binder, Jonas Löwgren & Lone Malmberg (eds.), *(Re)Searching the Digital Bauhaus*, Springer, London.
- [8] Elovaara, P., 2004, Angels in Unstable Sociomaterial Relations: Stories of Information Technology, Doctoral thesis, Blekinge Institute of Technology.
- [9] Sefyrin, J., 2010, Sitting on the Fence – Critical Explorations of Participatory Practices in IT Design, Doctoral thesis, Mid Sweden University.
- [10] Kensing, F., & Blomberg, J., 1998, Participatory Design: Issues and Concerns, *Computer Supported Cooperative Work*, 7, 167–185.
- [11] Sanders, E.B.N., & Stappers, P.J., 2008, Co-creation and the new landscapes of design. *CoDesign*, 4(1), 5–18.
- [12] Sefyrin, J., Gidlund, K.L., Danielsson Öberg, K., & Ekelin, A., 2013, Representational Practices in Demands Driven Development of Public Sector, *EGOV*, Springer-Verlag, Berlin Heidelberg.
- [13] Jansson, M., Mörtberg, C., & Berg, E., 2006, Old dreams, new means. An exploration of visions and situated knowledge of information technologies, *Journal of Gender, Work and Organization*, 14(4), 371–387.
- [14] Nilsson, O., 2005, Access Barriers – from a user’s point of view, Doctoral thesis, Mid Sweden University.
- [15] E-Delegacy, 2012, Vägledning för behovsdriven utveckling. [Guidelines for Demands Driven Development].
- [16] Orlikowski, W., & Baroudi, J., 1991, Studying information technology in organizations: Research approaches and assumptions, *Information Systems Research*, 2(1), 1–28.
- [17] Walsham, G., 2005, Learning about being critical, *Information Systems Journal*, 15(2), 111–117.
- [18] Bowker, G.C., & Star, S.L., 1999, *Sorting Things Out. Classification and its Consequences*, The MIT Press, Cambridge & London.
- [19] Sefyrin, J., forthcoming, Negotiating Difference in the Making of A Common Municipal School Administrative System in Sweden.
- [20] Butler, J., 1990, *Gender Trouble*, Routledge, London.
- [21] Butler, J., 1993, *Bodies That Matter: On the Discursive Limits of “Sex”*, Routledge, London.
- [22] Bratteteig, T., 1997, Mutual Learning. Enabling cooperation in systems design, in Kristin Braa & Eric Monteiro (eds.), *Proceedings of IRIS’20*, Department of Informatics, University of Oslo.
- [23] Whetherell, M., Taylor, S., & Yates, S.J., 2001, *Discourse Theory and Practice. A Reader*, Sage Publications, London.
- [24] Winter Jørgensen, M., & Phillips, L., 1999, *Diskursanalys som teori och metod*, Studentlitteratur, Lund. [Discourse Analysis as Theory and Method].
- [25] Laclau, E., & Mouffe, 1985, *Hegemony & Socialist Strategy*, London, Verso.
- [26] Laclau, E., 2006, Ideology and post-Marxism, *Journal of Political Ideologies*, 11(2), 103–114.

Evaluation of E-Participation in Social Networks: Russian E-Petitions Portal

Lyudmila BERSHADSKAYA, Andrei CHUGUNOV, Dmitrii TRUTNEV
ITMO University, Russia

Abstract. Methods and Technologies of e-participation are an important component of Information society and e-governance development programmes. E-petitions portals are one of the mechanisms of e-participation. They provide the opportunity for citizens to influence the process of decision making at federal, regional and municipal levels. At the same time issues of the impact of e-petitions on traditional way of political decision making still remain unexplored. The article describes the practical case of an official e-petition portal development in Russia. The study aims at identifying the demand for electronic petitions portal in Russia in three main areas: 1) the dynamics of initiatives' publishing across federal districts; 2) citizens' discussion on Russian e-petition portal in social media; 3) correlation analysis of citizens' demand indicators and citizens' satisfaction with authorities work and openness, as well as other economic indicators.

Keywords. e-participation, assessment, social networks, e-petitions portal, correlation analysis

Introduction

With the expansion of e-governance technologies, e-participation mechanisms become playing important role in political life. In international practice the issue of development of public e-participation mechanisms for political decision-making is no longer considered to be new. In Russia the electronic portal for public applications started to operate in 2013, therefore it is only now that it has become possible to see how the process is advancing.

Moreover, the existence of this portal itself doesn't give any information about its effectiveness and about the demand of e-participation. The research group conducted the survey of Russian e-petition portal with the purpose to measure citizens' demand of the portal and its' functions and to find connections between the portal usage and socio-economic indicators.

1. Heading Literature Review

E-participation, e-governance, online services, which are aiming to become the obligatory forms of interaction between government and citizens, are gradually becoming institutionalized in contemporary society. There are many examples of e-government development analysis in research practice.

At present the blogosphere and other social media researchers use social networks as a source of information about citizens' attitudes to government and their demand for e-government services. In particular, Sobkovitz and colleagues [1] used the method of social media automated content analysis to identify new trends in inclinations, moods, attitudes and expectations of interested groups or of society as a whole. As a result, they have presented a model of public opinion formation through social media. They explored the online community and social networking of immigrants moving to the Netherlands who are in need of assistance in obtaining such public services as residence registration, receipt of state allowance, admission to an educational institution, etc. The study confirmed the relationship between Internet discussions and the progress of real social processes.

S. Alathur and colleagues have identified several forms (channels) of e-participation, which may become the subject of research [2]: ICT development to unite citizens and create online education communities; ICT use for group conversations and discussions; ICT use to attract supporters, voters; Social media for voting and polls; Economic forums, e-business; Knowledge sharing platforms; Networks as monitoring systems. R. Medaglia analyses publications on e-participation, identifying them as belonging to a single scheme consisting of the following categories: e-participation activities, e-participation actors, e-participation effects, contextual factors, e-participation evaluation [3]. O. Fedotova and colleagues examined the relevance of the e-participation platform for citizens in Portugal and revealed that local e-participation initiatives have a predominantly informing character and there was a lack of high level initiatives [4].

The pilot project called Hub Websites for Youth Participation in Estonia, Germany, Ireland and the UK [5] is also worth mentioning. The study proved that, despite the importance of personal, face-to-face communication of citizens in discussions, debates on bills and decision-making, online participation tools are able to exert influence on democratic processes in the society. Researchers V. Lysenko and K. Desouza studied the potential of social media usage in Moldova and came to the conclusion that the skilful use of ICT may not just ensure the participation of citizens in the political life of the country, but also may drive an Internet revolution without any involvement of organizations and groups, which are not represented on the political scene [6].

A. Prosser investigates e-participation on the European Union level [7] with the focus on legal basis and technical possibilities for citizens participation. L. Bershadskaya and colleagues conducted comparative analysis of the USA, the UK and Russian e-petition portals and distinguished strong and weak traits of each portal [8]. S. Hale, H. Margaretts, T. Yasseri studied the petition growth on the UK web-site [9] and found out that most successful petitions grow quickly and the number of votes cast for a petition in the first day was a significant factor in explaining the overall number of signatures a petition received during its lifetime. R. Lindner and U. Riehm studied 571 traditional and 350 e-petitioners in Germany and indicated that both petitioner samples were characterized by an above average level of general political participation and Internet use [10].

A review of the scientific research allows one to summarize that the development of e-participation mechanisms constitutes a global trend. At the same time there is a lack of studies focused on the demand-side of e-petition portals.

Most surveys on e-government development in Russia focused on analysis of websites (web-monitoring), statistical surveys of their content, etc. At the same time

such important aspects as citizens' attitude to existing services and their need for new services remain unexplored.

Social media, being a popular and powerful communication instrument, can become the subject of research and a source of answers on urgent questions. The E-Government Center at ITMO University (St.Petersburg, Russia) conducted a special survey in this area in 2013-2014.

2. E-Petition Portal- "Russian Public Initiative"

E-participation technology is an important component of Information society and e-governance development programmes and e-petitions portals are examples of e-participation mechanisms.

In May 2012 the Decree of the President of the Russian Federation established the creation of information disclosure system about official regulations projects, the results of public consultation and putting of all the listed information on a joint site [11]. The same decree was instructed to adopt the concept of "Russian Public Initiative" (RPI), creating conditions for starting April 15, 2013 a public presentation of the citizens' proposals via a dedicated resource on the Internet. The concept provides the consideration of proposals supported of at least 100 thousand people within a year, after the approval of the expert working group with the participation of members of Duma, the Council of Federation and the business community. The development of e-petitions tools at regional and municipal level is the next step of the process. The concept of implementation of the above instructions was adopted in August 2012 [12].

Russian e-petition portal appeared in April 2013 and got the name "Russian Public Initiative" (<https://www.roi.ru>) because it's supposed to collect citizens' initiatives on federal, regional and municipal levels. Thus, a citizen may vote for the initiative in their region or municipality, and the range of potential initiatives becomes as extended as needed. To cast a vote on the Russian Public Initiative Portal it is required to register on the Common Government and Municipal Services Portal. This procedure is more time consuming as it requires the pre-registration and authorization.

The mechanism of working with applications is the following: once the petition gains 100,000 votes, it is submitted to the governmental working group consisting of 34 people. The expert group includes representatives of executive and legislative bodies, business community, non-profit organizations, scientific institutions and foundations.

In Russia, combining the responsibilities of legislative and executive branches has been attempted, that is why the expert group includes representatives of both branches. The portal demonstrates a very high level of anonymity; neither the applicant's name, nor the data about those who voted for petitions are not available to others.

The portal is notable for its clear separation and representation of initiatives on the federal, regional and municipal levels. More than that, RPI portal provides an option to vote against the initiative. The total number of votes is obtained by summing just the votes for the initiative, but the expert group receives the information about the total number of votes against the initiative as well.

3. The Research Methodology & Results

In accordance with international practice, the authors chose systematic approach for research and description of Russian e-petition portal. The research was focused on Russian Federation with its separation into 6 Federal districts. Several data sources has been selected for the analysis:

- statistics of RPI functioning,
- the results of social media analysis (discussions about RPI),
- federal statistics on citizens satisfaction with the authorities work, data on income level;
- results of public opinion polls held by Russian Fund “Public Opinion”.

The study is aiming at identifying the demand for electronic petitions portal in Russia in three main areas:

- the dynamics of initiatives’ publishing across federal districts,
- citizens’ discussion on RPI in social media,
- correlation analysis of citizens’ demand indicators and citizens’ satisfaction with authorities work and openness, as well as other economic indicators.

The hypothesis of the study was that there is a relationship between the peoples activity on the RPI portal and their filling of quality of life and evaluation of the authorities’ performance.

The study revealed the positive dynamics of initiative publishing on RPI during the last year (fig. 1) with a high level of interest’s growth in the first months of portals’ operation.

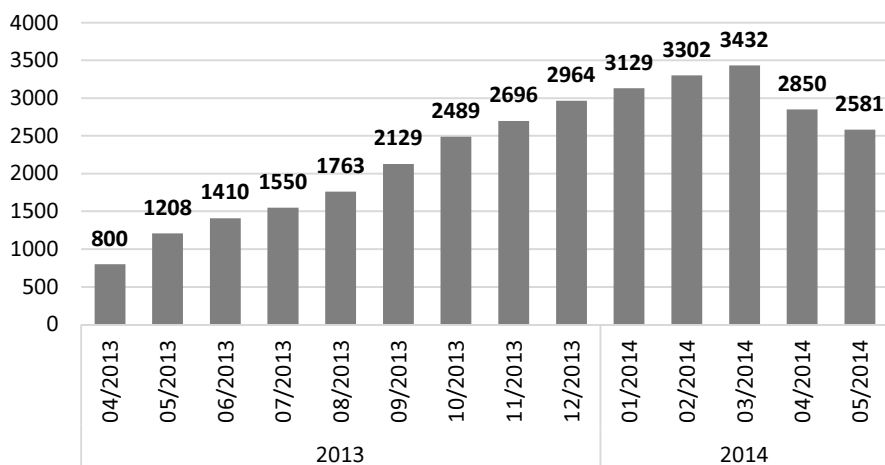


Figure 1. Dynamics of petitions publishing on RPI portal, 2013-2014

Today the portal collected almost 2,5 thousands initiatives and only 7 of them collected the required number of votes and were discussed in the expert group and legislative bodies.

Downward trend in the number of published initiatives that began to emerge in April 2014 can be explained by the fact that the initiatives did not achieve the required threshold of votes throughout the year after its publication began to be sent to the archive and by the decline in citizens' initial interest to this portal.

The first initiative which collected the required 100 000 votes was the initiative prohibiting officials and employees of state corporations and to buy cars, worth over 1.5 million roubles. It took 3 months to get the required number of votes.

Today there exist more than 30 computer-aided tools of searching and analysing of information from social networks. The social media monitoring service IQBuzz (<http://iqbuzz.ru/>) was selected as the research instrument as the most functional and suitable to work with the Russian-speaking audience.

In course of the survey the keywords related to RPI and its options were selected to be used by web-crawler for collection of all posts related to research topic and formation of data set consisted of all documents, information about the actors (age, sex, the auditory of blogs etc.) and their roles (author, follower, reader).

Social media analysis also identified the growth of citizens' attention to RPI during the last year. Fig. 2 represents the dynamics of discussions from October 2013 to March 2014. There were a little activity of citizens' discussion before this period but it doesn't exceed 2-5 messages per day.

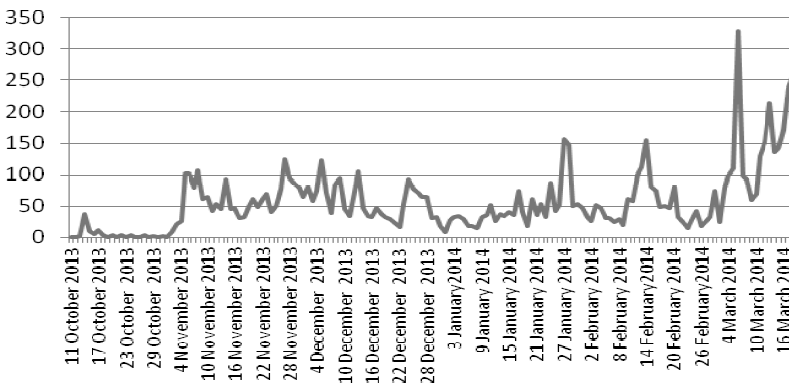


Figure 2. Number of posts in social media on RPI topic (IQBuzz), 2013-2014

The study on social media revealed that total audience coverage involved in RPI discussions reached 15,6 mln people. During the research period 6868 unique authors published messages on the related topic. The average amount of documents on RPI topic was 21,6 original messages per day. The average number of posts per 1 author reached the meaning of 1, 3 messages per day.

Correlation analysis of citizens' discussions and socio-economic indicators revealed the following trends (table. 1):

1. There is a strong relationships (correlation coefficient) between the number of Internet users in region and the number of authors who posted texts about RPI in social media from different regions (0,92) as well as between the number of Internet users in the region and the number of initiatives published on RPI portal (0,82).
2. There is a strong inverse relationships between the number of initiatives published on RPI portal per Internet users and the number of Citizens satisfied with the

authorities' openness (-0,88) as well as between the number of authors posted texts about RPI portal per Internet users and the number of Citizens satisfied with the authorities' openness (-0,73).

3. There is a strong relationship between the level of citizens' income in the region and the number of initiatives published on RPI portal (0,69) as well as level of citizens' income and the number of authors who published posts about RPI (0,65).
4. There is an inverse relationship between the level of people's happiness and their activity on publishing initiatives and posts (-0,33 and -0.38)

Table 1. Indicators of citizens' demand to RPI, 2014.

Federal districts / Russia	No. of Internet users (Mln)	No. of initiatives published on RPI portal	Authors published posts about RPI portal	Citizens satisfied with the authorities (%)	Citizens satisfied with the authorities' openness (%)	Income level (rub/ month)	% of citizens who feel that they are happy
Central	11,26	150	1221	39,2	25,7	29721	69,89
North-West	1,52	13	515	31,8	25,2	23403	72,20
Volga	5,65	57	426	37,3	25,1	19596	73,93
South	0,98	26	182	34,6	25,6	18602	75,33
The North Caucasus	0,67	2	40	32,5	26	17076	71,40
Ural	1,10	30	244	41,6	24,7	26174	68,00
Siberian	2,70	13	291	42,8	27,8	18322	71,92
Far Eastern	0,25	31	100	36,7	21,8	25325	69,63

4. Conclusions and future work

The research has led to the conclusion about the existence of relationship between the number of Internet users in the regions and their activity in the portal RPI. The additional hypothesis about the link between the citizens' activity on the portal and their assessment of the authorities' work has been proved also. The research revealed that if citizens were not satisfied with the authorities' openness it means their intention and will to publish petitions on RPI.

The research revealed that the happier people are, the less they publish initiatives on the portal. With increasing of citizens' income in the region, their interest in publishing posts about RPI is growing. This fact shows that people getting closer to the middle class are becoming more concerned about issues of social life's organization, inadequate legislation etc. and want to improve current conditions by publishing e-petitions and voting for them.

The study determined that social networks could be the sources of data for detecting citizens' interest in different topics. Citizens' discussions in social media about Russian e-petition portal correlate with the level of their activity on portal itself. At the same time, it's important to monitor both official petitions portals (such as RPI

portal) and similar local initiatives. Collected data could show the impact of institutional factor (legislation, rules and procedures) on the use of these portals.

Considering the problem of measuring the impact of e-participation projects, we should agree with B. Novek, which asserts that the legislative framework for transparency, by itself, has not produce a transparent government. "The introduction of new technology and new ways of thinking about information geared to groups may yield a more open administration. Similarly, the legal framework for participation has enshrined the right to participate in theory but not in practice" [13].

For further analysis of the development of e-participation projects in Russia and, in particular, the effectiveness and efficiency of their performance, it is advisable to apply the "Reference Framework for E-Participation", offered by S. Scherer and M. Wimmer. The reference framework for e-participation aims to support different target groups to communicate with other project actors, e.g. politicians, system developers, moderators – i.e. persons with different technical and political background and having a different perspective on an e-participation project [14].

The authors intend to continue their study of social media in relation to the topic of e-participation to determine the need for and the effectiveness of new technologies of interaction between government and civil society.

Completed research revealed the necessity to improve the text tonality of posts identification and engagement of linguistics experts. The further researches will be focused on political discussions and decisions on law adoption in conditions of citizen's benevolent or negative attitudes towards it. These conditions are tightening requirements for the use of the computer-aided assessment of text tonality and the interpretation of results obtained with their help.

This research has been supported by Russian Foundation for Humanities in the framework of the project "Electronic communication between government and society: a study of sociodynamics and institutionalization processes" (№ 13-03-00603).

This research was partially supported by research work №14-18-03434 "Interaction model between society and the elderly: a study of social inclusion possibilities" (Russian Scientific Fund).

References

1. P. Sobkowicz, M. Kaschesky, G. Bouchard, Opinion mining in social media: Modeling, simulating, and forecasting political opinions in the web, *Government Information Quarterly* **29** (1) (2012), 470-479.
2. S. Alathur, I. Vigneswara, M.P. Gupta, Citizen empowerment and participation in e-democracy: Indian context, *Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance*, (2011), 11-19.
3. R. Medaglia, eParticipation research: Moving characterization forward (2006-2011), *Government Information Quarterly* **29**(2012), 346-360 .
4. O. Fedotova, L. Teixeira, H. Alvelos H., E-Participation in Portugal: evaluation of governmental electronic platform, *Procedia Technology* **5**, (2012), 152-161.
5. P. Pruulmann-Vengerfeldt, E. Taylor-Smith, S. Kimpeler, Youth participation trough distributed discussion, *Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance*. ICEGOV 2011(2011), 289-292.

6. V. Lysenko, K. Desouza, Moldova's Internet revolution: Analyzing the role of technologies in various phases of the confrontation, *Technological forecasting and social change* **79** (2012), 341-361.
7. A. Prosser, eParticipation on the European Union Level. *Technology-Enabled Innovation for Democracy, Government and Governance*. Springer Berlin Heidelberg (2013), 1-8.
8. L. Bershadskaya, A. Chugunov, D. Trutnev, E-Participation Development: A Comparative Study of the Russian, USA and UK E-Petition Initiatives. In: *Proceedings of International Conference ICEGOV 2013*(2013), 73-76.
9. S. Hale, H. Margetts, T. Yasseri, Petition Growth and Success Rates on the UK No.10 Downing Street Website, *WebSci'13. Proceedings of the 5th Annual ACM Web Science Conference*, Paris, France, (2013), 132-138.
10. R. Lindner, U. Riehm, Broadening Participation Through e-Petitions? An Empirical Study of Petitions to the German Parliament, *Policy & Internet* **3** (1) (2011), 1-23.
11. Decree of the President of the Russian Federation on May 7, 2012 No. 601.(2012), <http://www.rg.ru/2012/05/09/gosupravlenie-dok.html>
12. Concept of citizens' proposals e-presentation mechanism formation for Russian government consideration. August 2012 (2012), <http://government.ru/docs/20405/>
13. D.S. Novek, Wiki Government. Wach., DC: Brookings Institution Press, (2009).
14. S. Scherer, M. Wimmer, E-Participation and Enterprise Architecture Frameworks: An Analysis, *Information Polity* **17** (2012), 147-161

Stakeholder Involvement in Public e-Service Development – Broadening the Scope of User Involvement

Ida LINDGREN

Department of Management and Engineering,
Linköping University, Sweden
ida.lindgren@liu.se

Abstract. This paper investigates if user involvement (UI) theory and theory on stakeholder theory (ST) can be merged to form a new theoretical entity that can inform whose voice should be heard in public e-service development. The investigation is based on a hermeneutic literature review and analysis. The result is a merger of ideas on *who* should be involved (extracted from stakeholder theory) with ideas on *why* this involvement should be organized (extracted from the user involvement literature). The paper presents research in progress, meaning that the merger presented is not particularly advanced. Still, this merger of ideas is substantial and important as it could function as the fundament for a more elaborate understanding of how to determine who should be involved in public e-service development. Involving the ‘right’ actors is believed to lead to higher quality in public e-services; therefore, advancement in our knowledge on how to identify these actors and finding better ways of involving these actors is needed.

Keywords: public e-service, development, user involvement, stakeholder theory.

1. Introduction

Public e-services have been developed and used by governmental organizations worldwide for some time now. Public e-services can be understood as electronically mediated services, provided by public organizations, through which users (citizens/businesses) and the supplying organization co-create some value through the users’ consumption of the service [26]. The development of these services is steered by policies on the international, national, and local level; as well as based on expectations expressed by citizens. Still, the supplying organizations of these public e-services experience persistent problems concerning e.g., marketing existing public e-services in order to reach the intended users, and developing e-services that these users want to use. As a response to these problems, the e-government literature testifies on the usefulness and necessity of user involvement as a means to develop public e-services that meet the demands of their intended users [21]. This theme is particularly salient in the Scandinavian context (both research and practice); a context characterized by a political and cultural climate in which a relatively high degree of worker/citizen involvement is expected and sought after [13]. In line with this expectation, the governmental committee guiding e-government initiatives in Sweden (the e-

Delegation), has authored guidelines on how to develop public e-services in a 'demand-driven' manner, focusing on the needs of the intended users [11]. Despite considerable research and practice-oriented efforts to guide user involvement in the development phase of public e-services, achieving user involvement has proven difficult in practice [2] [3].

A frequent critique against user involvement (UI) literature concerns the meaning of 'involvement'; a term that is discussed as being too vague. In this paper, however, I argue that a possible reason for the persistent problems of involving users lies in the term 'user'. 'User' is most often associated with the people *using* a particular system; sometimes referred to as end-users. When looking closer at public e-service development however, several scholars have pointed out that there are indeed additional actors than the end-users who need to be involved in the development of these services if they are to become useful and efficient [3]. Therefore, alongside with the discussion on user involvement, stakeholder theory (ST) is gaining increased attention in e-government research and practice. ST is a theoretical framework aimed at helping managers to address questions about the organization's purpose and its responsibilities to specific actors; discussed under the label *stakeholders* [15]. ST supplies concrete tools for how to identify and manage important actors; several of these ideas have been successfully transferred to the public sector [7]. An important contrast between ST and UI involves underlying values; although ST is more inclusive concerning what actors should be involved, this stream of literature is typically written from a clear management perspective. Concerning the democratic ideals underlying the development of public e-services, it can be argued that ST lacks important sociopolitical ideals concerning democracy. These democratic ideals are however an integral part of the Scandinavian UI literature. This paper explores theory on UI and ST with the aim to answer the following question; *can user involvement theory and theory on stakeholder management be merged to form a new theoretical entity that can inform whose voice should be heard in public e-service development?* The result of this investigation is presented according to the following logic. First, user involvement is briefly discussed, followed by a section on stakeholder theory and management. These two theoretical concepts are then discussed in relation to each other. Last, a conceptual merger of these two theoretical ideas is suggested.

2. Research Approach

This paper is a theoretical essay discussing and relating concepts related to the active involvement of actors in the development process of public e-services. The paper is based on a literature review conducted as a hermeneutic process [6]; meaning that the review is shaped by the researcher's pre-understanding. The search is steered and broadened based on concepts identified in the literature. This is an iterative process in which the review and analysis processes are naturally intertwined; aimed at identifying themes, contrasts, and gaps in the body of literature on a particular subject [6]. The search is not conducted completely without structure. In this study, the search was in part conducted as a forward- and backward search; as discussed by Webster and Watson [38]. Such a search needs a point of departure. Concerning the ST literature, the starting point was the work on ST in e-government presented by Flak and Rose [14] and Scholl [33]. From these two publications, a backward and forward search was conducted in order to find key publications on this topic. Regarding user involvement,

the starting point was the nominal book by Schuler and Namioka [35]. Based on this approach, literature on user involvement and stakeholder theory was explored with the aim to better understand these concepts in relation to the public e-service development context. Parts of the reasoning presented in this paper has been presented and subjected to review previously [24] [25]. The feedback received previously has been used to refine the ideas and search criteria for finding additional publications for analysis. The review and analysis has been guided by the explorative purpose of investigating the meaning of 'user' in user involvement, and whether the 'stakeholder' concept can broaden our understanding of whose interests that need to be taken into account in public e-service development.

3. User Involvement in Public e-Service Development

In the Scandinavian research tradition, the emphasis on involving users in the development of technology and work procedures was introduced under the label of *participatory design* [13] [19] [35]. The participatory design approach stemmed from socio-technical experiments in the 1970s, aimed at increasing democracy in the workplace [12] [13], and successive political reforms that gave workers rights to influence the introduction and use of technology in the work place. In the participatory design approach, user involvement is discussed in both *political* and *technical* terms [13]. The political origin and focus is visible in the humanistic approach to user involvement represented by scholars such as Mumford [29] [30]. In this line of research, the focus lies on democracy in the workplace and workplace satisfaction as user involvement is seen as a means of warranting workers' work quality and designing systems that fit the workers' needs. This approach has an obvious bottom-up perspective on the actors in the organization and can easily be translated to the e-government context if focusing on 'citizens' rather than 'workers'. This view on involvement corresponds well with the ideas of increased transparency and democracy through active involvement of citizens in the development of public e-services [24]. The technical approach to user involvement, is visible in the general IS development literature, in which the focus lies on designing IT systems [27]. In this literature, user involvement is seen as a way of ensuring information and knowledge needed for designing high quality IT [36]. It is also seen as a way of stimulating user acceptance of new technology [10]. The perspective on the organization in this line of reasoning is typically 'top-down'; often from a project-management perspective. The technical approach to user involvement is useful also in the e-government context as involvement of users indeed can be a way of ensuring the required baseline information for designing public e-services that meet the demands of their intended users.

Over time, the participatory design approach evolved into distinguishable approaches, such as participatory design, user-centered design, and contextual design [22]. These approaches were developed and introduced in contrast to each other, but have come to resemble one another [22]. There are four features that these user involvement approaches have in common [8]; they all emphasize (1) the importance of system designers experiencing work practices first-hand; (2) the importance of ensuring genuine participation from involved actors; (3) the necessity of developing a coherent vision for the new system and work procedures; and (4) the importance of anchoring this vision with the affected stakeholders. There are scholars who claim that the approaches to user involvement still have important and differentiating features that

matter for the development of public e-services [21]. The argument in this paper, however, is built on the idea that these approaches are similar in most important respects. The author acknowledges that there are, indeed, various approaches to user involvement, but argue that these share most important features – at the very least the aforementioned four features. Henceforth, these theories are therefore treated as one, and referred to as *user involvement*.

The basic idea with user involvement is that “all types of users of a new system must be involved in different ways in the design of the relevant parts of a system” ([8]; p.120). Similarly, Iivari et al. ([20]; p.111) state that; “[u]sers usually are the best experts on the local work practices to be aligned with and to be supported by a system”. Also in the e-government field user involvement in development to public e-services is promoted [2] and discussed [4]. In addition, the discussion on user involvement in e-government is accompanied by discussions on *user-* and *demand-driven development* (e.g., [11]). In practice, it is however difficult to motivate and organize involvement of users [17]; e.g., finding suitable user representatives for involvement [2]. As stated previously, in the Swedish context, the e-Delegation has authored guidelines for governmental agencies on how to identify the demands of the “target group”, and how these demands should be taken into account when developing public e-services [11]. Publishing these guidelines was an important statement made by the e-Delegation, marking an expectation of a more user-driven focus when developing public e-services. But user-driven development seldom makes it past the rhetorical level [23]. In addition, when taking a closer look at these guidelines they contain no information on how to identify the target group of a given public e-service [24]. Furthermore, the meaning of the term ‘target group’ is not defined, nor problematized. These flaws in the guidelines leave each user of the guidelines with the task of defining the meaning of this term. This leads us to the core of user involvement; who is this ‘user’ that should be involved?

In the face of numerous studies on user involvement, the ‘user’ remains elusive when the studies are examined in detail [20]. Typically, the meaning of ‘user’ is broad; including not only those people interacting directly with the system. For example, Cavaye ([9]; p.312) states that users can belong to different levels of the organization and have different relationships to the system: “[t]here is senior management that may use a system’s output and that is ultimately responsible for an organization’s investments and profitability. There is middle management that manages and monitors the work affected by the system. Thirdly, there are the employees who carry out the work and who would interact with the system on a day-to-day basis”. Similarly, Damodaran [10] argues that users from top management, middle management and end-user representatives must be involved; these should be involved in several, and different, phases of the design process. The final end-users, also called ‘first-level’ or ‘primary’ users, are defined as the ones who will interact directly with the system as part of their work [10]. Putting these definitions side by side, it is obvious that they provide a varying and somewhat unclear picture of who the ‘user’ is.

Considering the variety of what actors are included in the ‘user’ concept, it is perhaps not surprising that user involvement in public e-service development is difficult. Several studies have illustrated the importance of identifying all potential actors affected by public e-service development, e.g., the work by Scholl [34] and Axelsson, Melin and Lindgren [2] [3], and some clarity seems to have been provided with the help of stakeholder theory.

4. Stakeholder Theory and Management

During the last decade, stakeholder theory (ST) has gained attention in the e-government field. A stakeholder is defined as “any group or individual who can affect or is affected by the achievement of the organization’s objectives” ([15]; p. 46). The core of ST is the idea of *managing* stakeholders in various ways; managing the organization’s stakeholders is seen as a way to ensure effective and efficient management [16]. The underlying logic is to first identify the organization’s stakeholders, and subsequently decide whether these stakeholders should be involved or managed in some way. ST is highly useful for discussing the large variety of actors involved in e-government projects such as public e-service development; visible in the successful transfers of ST to the public sector [7] and the e-government context (see e.g., the works by Flak et al. [14] [31] and Scholl [33] [34]). The question of how to *identify* stakeholders is a research topic in itself. As a complement to general frameworks aimed at identifying stakeholders (the most cited being Mitchel, Agle and Wood’s framework from 1997 [28]); several adapted typologies aimed at identifying stakeholders in the specific e-government context have been presented (see [3] [18] [24] [31]).

Turning to the *management* of stakeholders, many different meanings are put into the term stakeholder management. In a well-cited publication by Blair and Whitehead ([5]; p.155), stakeholder management is described as “integrates in a systematic way what managers often deal with separately: strategic management, marketing, human resource management, public relations, organizational politics, and social responsibility”. Similarly, Heeks [18] state that stakeholder management includes a variety of activities; from active participation of stakeholders in the development process, to communication and expectation management, or financial rewards and punishments. An example of a stakeholder management strategy seen in the ST literature concerns identifying stakeholders’ potential for cooperation with, or threat to, the organization or issue at hand; and subsequent suggestions on actions that can be taken in order to prevent or decrease threats (e.g., [32] [37]). In short, and somewhat simplified, stakeholder management involves creating opportunities for stakeholders to adopt a supportive position in relation to the focal organization or issue. Stakeholder management may include direct interaction between managers and stakeholders, and can thus be understood as some kind of *involvement* of stakeholders.

Although stakeholder management as a term can be given a broad meaning and understood as a wide range of arrangement, it is clear that the main focus lies on the well-being of the core organization, project, or even management. Several scholars, such as Heeks [18], state that stakeholders should be identified by examining who has the power to make the project fail in some way, thereby illustrating a strong management focus. There is a normative strand of ST in which stakeholders are discussed from an ethical and moral standpoint [14], but the main values of ST in general still involve successful management and profit for the focal organization. The management focus present in ST is important to address as it captures some of the reality and issues of project managers; also in the e-government context. However, considering that those responsible for e-government initiatives must accommodate objectives directed both at the internal efficiency of the government, *and* objectives directed towards citizens and the society at large, the managerial focus in ST may however be problematic for public e-service development [24]. Putting too much emphasis on the views of the management may result in important stakeholders being

left out of the development process [1]. This may, in turn, result in public e-services that very few external stakeholders want to use, or unanticipated and undesirable influences on work procedures for internal stakeholders.

5. Stakeholder Involvement – a conceptual merger

As illustrated above, achieving user involvement when developing public e-services has proven difficult. When taking a closer look at the term in focus – the user – there is a great variety in how inclusive, or exclusive, this term is in the research literature. When moving our attention to guidelines targeted towards practitioner, there is a lack of clear-cut definitions of the ‘target group’ or ‘user’ that these practitioners are asked to let ‘drive’ the development of the public e-services. For practitioners wanting to organize user involvement in practice, there is little theoretical guidance to be had.

In the introduction of this paper, I asked if user involvement theory and theory on stakeholder management can be merged to form a new theoretical entity that can inform whose voice should be heard in public e-service development. As a possible step forward in clarifying the meaning of ‘user’ in ‘user involvement’, I suggest that the term ‘user’ is replaced by the term ‘stakeholder’. The stakeholder typologies available in the e-government literature are more finely grained and more inclusive than the term ‘user’. The e-government stakeholder typologies available in the literature include not only the ‘user’ but also e.g., lower level employees handling the output of public e-services, sponsors, politicians, system developers, and project management roles. As a result, involvement of actors can be discussed in terms of *stakeholder involvement*; referring to system developers’ and project management’s direct contact with other stakeholders when developing information technology (here, public e-services), covering several different approaches and methods.

Exchanging ‘user’ with ‘stakeholder’ means that the perspective from which the involvement is organized is shifted and broadened. Somewhat simplified, involvement of actors in the development of public e-services can be organized and viewed from three perspectives; bottom-up, middle-out, or top-down. Here, ‘bottom-up’ refers to when the perspective of the people at the bottom of the organizational hierarchy is used as the point of departure; whereas ‘top-down’ refers to when a top-management perspective is adopted. Last, ‘middle-out’ refers to the middle-management perspective (here, the project management perspective). E-government literature in general often discusses public e-service development from a citizen perspective (bottom-up) or a top-management perspective. Stakeholder involvement is however typically organized on the project level. In order to be helpful for practice, the perspective inherent in ‘stakeholder involvement’ should mirror the perspective of those responsible for organizing it in practice. By combining stakeholder theory with user involvement issues, I argue that a *middle-out perspective* is adopted. I aim to promote a discussion on public e-services from a citizen and a management perspective combined. A stakeholder involvement approach further implies that both of these groups are made up by multiple layers of people and processes that need to be taken into account when developing public e-services.

What I propose is not only an exchange of terms, but a merge of ideas. The reason for this merger is that I find the UI take on how to ‘manage’ people affected by new technology as more cohesive with the ideas of e-government and the development of public e-services. Considering that the goals of public e-services include both the needs

and wishes of the citizens, and an increased efficiency and effectiveness of government, it is vital that the project management responsible for public e-service development is able to expand their outlook to include all of these actors. It is also important to consider involving representatives of these various stakeholder groups in the development and implementation of the public e-service in various ways. This requires a more humanistic outlook on stakeholders than the one presented in the stakeholder theory literature. In this paper, the merger is constituted by combining ideas on *who* should be involved (extracted from stakeholder theory) with concepts on *why* this involvement should be organized (extracted from the user involvement literature). The merger is perhaps not particularly advanced, nor mature; the concepts are merely extracted and aligned. I believe that, with further work, these concepts can be elaborated and integrated to further inform involvement practices in public e-service development.

6. Conclusions and future research

Considering that the goals of public e-services include both the needs and wishes of the citizens, and an increased efficiency and effectiveness of government, it is vital that the project management responsible for public e-service development is able to expand their outlook to include all of these actors. This expansion can be made using the stakeholder concept. It is also important to consider involving representatives of these various groups in the development and implementation of the public e-service in various ways. This requires both a humanistic and technical outlook on involvement; such as the one found in user involvement literature. Respecting stakeholders' interests can lead to improved e-government projects that increase the government's reliability and political credibility, but requires that stakeholder interests are described and analysed using appropriate tools [14] [24]. Public e-services often affect external, as well as internal, stakeholders with legitimate claims regarding the e-service. These stakeholders are likely to have somewhat diverse views on the e-service, and it is not likely that all of these stakeholder views and objectives can be respected to the full. Hence, stakeholder interests must be analysed and prioritized in order to assess which stakeholder involvement strategies to implement. By doing so, the quality of the e-service should be improved.

In this paper, two ideas are merged by combining literature on how to identify and characterize *stakeholders* (extracted from stakeholder theory) with literature on *involvement* (extracted from the user involvement literature). The merger implies that ideas on stakeholder *management* have been excluded in favor of user involvement concepts. Furthermore, the merger entails an abandonment of the *user* term, as presented in the user involvement literature, in favor of the term stakeholder. The result is a suggestion that further conceptual work is needed on formulating a conceptual framework on *stakeholder involvement*.

The merger presented in this paper is not particularly advanced; the basic ideas are merely extracted and aligned. Still, this merger of ideas is substantial and important as it could function as the fundament for a more elaborate understanding of how to determine who should be involved in public e-service development. Involving the 'right' actors is believed to lead to higher quality in public e-services; therefore, advancement in our knowledge on how to identify these actors and finding better ways of involving these actors is needed.

The ideas presented in this paper constitute an important knowledge contribution but need to be elaborated further. With further conceptual work on this topic, as well as empirical application of these ideas, the ideas presented here can turn into a useful framework for stakeholder involvement in e-government initiatives such as public e-service development.

Acknowledgements

I would like to thank the anonymous reviewers for their input on this paper. I especially want to thank one of the reviewers; a person who must have spent considerable effort on reviewing the paper. Thank you for scrutinizing and discussing each part of paper and giving me suggestions on how to strengthen the arguments. Your comments were helpful for the revision of this paper and will be useful also for future publications on this topic.

References

- [1] Axelsson, K., Melin, U. & Lindgren, I. (2009). Developing public e-services for several stakeholders – A multifaceted view of the needs for an e-service. In Newell S, Whitley E, Pouloudi, N, Wareham J, Mathiassen L (Eds.), *Proceeding of the 17th European Conference on Information Systems (ECIS2009)*, Verona, Italy, 8-10 June 2009, pp. 2804-2815.
- [2] Axelsson, K., Melin, U. & Lindgren, I. (2010). Exploring the Importance of Citizen Participation and Involvement in E-government Projects – Practice, Incentives and Organization. *Transforming Government: People, Process and Policy*, 4(4), 299-321.
- [3] Axelsson, K., Melin, U. & Lindgren, I. (2013). Public e-services for Agency Efficiency and Citizen Benefit – Findings from a Stakeholder Centred Analysis. *Government Information Quarterly*, 30(1), 10-23.
- [4] Bertot, J. & Jeager, P. (2006). User-centered e-government: Challenges and benefits for government Web sites. *Government Information Quarterly*, 23(2), 163-168.
- [5] Blair, J.D. & Whitehead, C.J. (1988). Too many on the seesaw: stakeholder diagnosis and management for hospitals. *Hospital and Health Services Administration*, 33(2), 153-166.
- [6] Boell, S. & Cezec-Kecmanovic, D. (2011). Are systematic reviews better, less biased and of higher quality? In *ECIS 2011 Proceedings*. Paper 223. <http://aisel.aisnet.org/ecis2011/223>.
- [7] Bryson, J. (2004) What to do when stakeholders matter. Stakeholder identification and analysis techniques. *Public Management Review*, 6 (1), 21-53.
- [8] Bødker, K., Kensing, F. & Simonsen, J. (2011). Participatory design in information systems development. In Isomäki, H. & Pekkola, S. (Eds.), *Reframing Humans in Information Systems Development, Computer Supported Cooperative Work 201*. London: Springer-Link.
- [9] Cavaye, A. (1995). User Participation in System Development Revisited. *Information and Management*, 28(5), 311-323.
- [10] Damodaran, L. (1996). User involvement in the systems design process – a practical guide for users. *Behaviour and Information Technology*, 15(6), 363-377.
- [11] E-delegationen (2012). *Vägledning för behovsdriven utveckling*. Accessed on 2013-04-01 at <http://www.behovsdrivenutveckling.se/>
- [12] Ehn, P. (1989) *Work-Oriented Design of Computer Artifacts*. Arbetslivscentrum. Falköping: Gummessons.
- [13] Ehn, P. (1993) Scandinavian Design: On Participation and Skill. In Schuler and Namioka (Eds.) *Participatory Design. Principles and Practices*. Hillsdale: Lawrence Erlbaum.
- [14] Flak, L.S., & Rose, J. (2005). Stakeholder Governance: Adapting Stakeholder Theory to E-Government. *Communications of the Association for Information Systems*, 16(1), 642-664.
- [15] Freeman, E. (1984). *Strategic Management: A Stakeholder Approach*. Pitman, Boston.
- [16] Freeman, R. E., Harrison, J., Wicks, A., Parmar, B., & De Colle, S. (2010). *Stakeholder Theory. The State of the Art*. Cambridge UP.

- [17] Hallqvist, C. (2012). *Passion for Participation. The Importance of Creating Support for Motivation*. Mid Sweden University Doctoral Thesis 123.
- [18] Heeks, R. (2006). *Implementing and Managing eGovernment. An international text*. London: Sage.
- [19] Iivari J., & Lyytinen K. (1996) Research on information systems development in Scandinavia – unity in plurality. *Scandinavian Journal of Information Systems*, 10(1 & 2), 135-186.
- [20] Iivari, J., Isomäki, H. & Pekkola, S. (2010). The user – the great unknown of systems development: reasons, forms, challenges, experiences and intellectual contributions of user involvement. *Information Systems Journal*, 20 (2), 109-117.
- [21] Karlsson, F., Holgersson, J., Söderström, E. & Hedström, K. (2012). Exploring user participation approaches in public e-service development. *Government Information Quarterly*, 29(2), 158-168.
- [22] Kujala, S. (2003). User involvement: a review of the benefits and challenges. *Behaviour & Information Technology*, 22(1), 1-16.
- [23] Lindblad-Gidlund, K. (2012). Demand Driven Development of Public e-Services. In. Scholl, J. et al. (Eds.) *Lecture Notes in Computer Science*, vol. 7443, 66-77.
- [24] Lindgren, I (2013). Public e-service stakeholders. A study on who matters for public e-service development and implementation. PhD Thesis. Linköping Studies in Arts and Science, No. 580. Linköping: Linköpings universitet.
- [25] Lindgren, I. (2012). Towards a Conceptual Framework for Identifying Public e-Service Stakeholders: On Where to Start Looking. In Scholl H.J., et al. (Eds.), *Electronic Government and Electronic Participation*. Joint Proceedings of Ongoing Research and Projects of IFIP EGOV and IFIP ePart 2012. Trauner Verlag.
- [26] Lindgren, I. & Jansson, G. (2013). Electronic Services in the Public Sector: A Conceptual Framework. *Government Information Quarterly*, 30(2), 163-172.
- [27] Lynch, T. & Gregor, S. (2004). User participation in decision support systems development: Influencing system outcomes. *European Journal of Information Systems*, 13(4), 286-301.
- [28] Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts. *Academy of Management Review*, 22(4), 853-886.
- [29] Mumford, E. (1979). Consensus systems design: An evaluation of this approach, in Szyperski, N. and Grochla, E. (Eds.). *Design and Implementation of Computer Based Information Systems*, Sijthoff and Noordhoff, Gromingen.
- [30] Mumford, E. (2000). A Socio-Technical Approach to Systems Design. *Requirements Engineering*, 5(2), 125-133.
- [31] Sæbø, Ø., Flak, L. & Sein (2011). Understanding the dynamics in e-Participation initiatives: Looking through the genre and stakeholder lenses. *Government Information Quarterly*, 28, 416-425.
- [32] Savage, G., Nix T., Whitehead, C.J. & Blair, J.D. (1991). Strategies for assessing and managing organizational stakeholders. *Academy of Management Executive*, 5(2), 61 – 75.
- [33] Scholl, J. (2001). Applying stakeholder theory to E-Government. Benefits and Limits. In Schmid, B., Stanoevska-Slabeva, K., and Tschammer, V. (Eds.) *Towards the E-Society: E-Commerce, E-Business, and E-Government*, pp.735-747. Hingham, MA, USA: Kluwer Academic Publishers.
- [34] Scholl, J. (2004) Involving salient stakeholders. Beyond the technocratic view on change. *Action Research*, 2(3), 277-304.
- [35] Schuler, D. & Namioka, A. (1993). *Participatory design. Principles and practices*. Hillsdale: Lawrence Erlbaum Associates. CRC Press.
- [36] Subramanyam, R., Weisstein F., & Krishnan, M. (2010) User participation in software development projects. *Communications of the ACM*, 53(3), 137-141.
- [37] Tennert, J.R. & Schroeder, A.D (1999). *Stakeholder analysis: a tool for network management*. Paper presented at the 60th Annual Meeting of the American Society for Public Administration, Orlando, Florida, April 10-14, 1999.
- [38] Webster, J. & Watson, R.T. (2002). Analyzing the past to prepare for the future: writing a literature review. *MIS Quarterly*, 26(2), xiii-xxiii.

Open Data and Interoperability

This page intentionally left blank

Automatic Generation of Roadmaps for Open Data

Mauricio SOLAR¹ Fernando DANIELS² and Roberto LOPEZ³

¹Universidad Técnica Federico Santa María - UTFSM, Chile

²Inter-American Organization for Higher Education, OUI-IOHE, Canada

³The Network of e-Gov Leaders of Latin America and the Caribbean, RED GEALC

mauricio.solar@usm.cl, danielsf@oui-iohe.org,

roberto.lopez@redgealc.net

Abstract. This article presents a model to assess maturity and capabilities of public agencies (PAs) in pursuing the Open Government Data (OGD) principles and practices. The OGD maturity model, called OD-MM, was piloted in seven PAs from three Latin American countries (Chile, Colombia, and El Salvador), validating the web tool that operationalizes the model. The OD-MM is a valuable diagnosis tool for PAs, since it detects weaknesses and automatically generates a roadmap to evolve to higher maturity levels in the implementation of OGD. The automatic generation of optimal roadmap is detailed.

Keywords: Roadmaps, Maturity Model, Open Data, Open Government Data

Introduction

The *Open Government* approach attempts to put data at the disposal of all citizens, which has proven to generate an important public value [[1]]. Lathrup and Rume in their *Open Government* book [[2]] bring up three fundamental concepts for a better understanding of the *Open Data* impact:

- Public Service Information (PSI) is a kind of infrastructure, with the same importance level as other infrastructures (water, electricity, roads).
- Public value must be maximized as of existing data held by government.
- The open data magic is that it enables transparency and innovation.

Several authors have presented different criteria to assess and diagnose the *Open Government Data* (OGD), such as the famous eight principles of OGD [3], the "five stars" test proposed by Berners-Lee [4], the Gartner Open Government Maturity Model [5], the Smart Government Maturity Model in Central and Eastern Europe [6] or the Open Data Readiness Assessment tool created by the World Bank [7], among others. Nevertheless, Kalampokis, Tambouris and Tarabanis in [8] admit that, despite the potential that the various models recently emergent in literature, as those previously presented, there is currently a lack of roadmaps, guidelines and benchmarking frameworks to drive and measure OGD progress.

Hence, there is a need to measure and assess the readiness of public agencies (PAs) to implement OGD and to automatically generate a roadmap. The Open Data Maturity Model (OD-MM) [9] was a result of a project carried out to satisfy this need. The project was developed by the Computer Engineering Department at Universidad Técnica Federico Santa María (Chile) with funding from the Canadian International Development Research Centre (IDRC, www.idrc.ca), and the support of CTIC Foundation (www.fundacionctic.org), the Organization of American States (OAS, www.oas.org), the Inter-American Organization for Higher Education (OUI-IOHE) and Red GEALC (www.redgealc.org). The advantage of the OD-MM is that, as from the diagnosis of a PA it automatically generates the roadmap with recommendations to evolve to higher levels of organizational maturity.

Next section, in a brief summary, introduces the OD-MM maturity model. OD-MM was evaluated and validated by expert public officials from three Latin American governments (Chile, Colombia, and El Salvador) through a pilot study and several workshops, and the model was finally applied to a selection of seven PAs, generating the first formal measurements of their readiness for OGD. Section 2 shows the region-wide diagnosis. Section 3 presents a roadmap generated automatically with recommendations. Last section shows the conclusions.

1. Maturity Model and OGD Capacities

Reggy [10] defines a four levels model for the eight principles, and each of them has a score (0%, 33%, 66%, 100%) according to its level (see Table 1). An indicator assesses the global quality by averaging the score associated to the eight principles. Another model with five maturity levels, called “Methodology for releasing Open Data” (MELODA), covers three dimensions (Table 1). Morgan recommends in his blog developing a three dimensions maturity model and four maturity levels (emerging, practicing, enabling, and leading) [11]. Lee and Kwak in [12] recommend agencies to advance their open government initiatives incrementally in stages, moving from one stage to another as they mature their adoption of open government. The stages are: (1) increasing data transparency, (2) improving open participation, (3) enhancing open collaboration, and (4) realizing ubiquitous engagement. Kalampokis et al. in [8] proposed a stage model for OGD with two main dimensions as seen in Table 1.

Important elements that can be identified in Table 1 and that should be considered when diagnosing the implementation of OGD at PA level are those that stand out in successful cases described in literature ([8], [9], [10], [12]). Among these dimensions the following are important to be considered:

- The **establishment** of a PA, given that the importance of leadership and strategy in OGD initiatives is highlighted in literature.
- The **legal** aspect, allows to having a legal frame when implementing OGD.
- The **technological** perspective as for the accomplishment of OGD principles, such as access to data, data quality and its availability.
- The **citizen** perspective as from participation and collaboration point of view.
- And **developers** and **entrepreneurs** in the reuse of data.

Table 1. Summary of maturity models in OGD

Reference	Maturity levels/stages	Dimensions
Reggy [10]	1. 0% 2. 33% 3. 66% 4. 100%	Eight principles (complete, primary, timely, accessible, machine processable, non-discriminatory, non-proprietary, license-free)
Lee and Kwak [12]	1. Increasing Data Transparency 2. Improving Open Participation 3. Enhancing Open Collaboration 4. Realizing Ubiquitous Engagement	<ul style="list-style-type: none"> • Public engagement/openness (Value/benefits) • Technical/managerial complexity (Challenges/risks)
Morgan [11]	1. Emerging 2. Practicing 3. Enabling 4. Leading	<ul style="list-style-type: none"> • Strategy and Policy • Availability • Description & Documentation Practices
Kalampokis, Tambouris and Tarabanis [8]	1. Aggregation of Gov Data 2. Integration of Gov Data 3. (2)+Non-Gov Formal Data 4. (3)+Social Data	<ul style="list-style-type: none"> • Organizational & technological complexity • Added value for data consumers
MELODA [12]	1. Copyright 2. Private Use 3. Non-commercial reuse 4. Commercial reuse 5. Only recognition	<ul style="list-style-type: none"> • Legal Framework • Technical Standards • Accessibility to Information

All these elements are considered in the OD-MM developed to assess the capabilities and maturity of PAs in the OGD implementation.

OD-MM is in three levels hierarchically structured: Domain (D_1, D_2, D_3), Subdomain (S_{ij}) and Variables (V_{ijk}). The designed OD-MM incorporates three domains: D_1 - *Institutional and Legal*; D_2 - *Technological* domain; and D_3 - *Citizen's & Entrepreneurial* domain. Each domain has three subdomains (S_{ij} in Figure 1). The conceptualization of 33 variables (V_{ijk} in Figure 1) distributed in nine subdomains is described in [9]. Four capacity levels, from 1 to 4 (Inexistent, Emerging, Existent and Advanced), were established to assess the capacity in each of these variables.

The OD-MM model was validated in conceptual terms by government representatives of Chile (Ministry of the Dept. of Presidency), Colombia (Ministry of Information Technologies and Communications), and El Salvador (Dept. of Technologic and Information Technologies Innovation), civil society and open data application developers (Foundation Intelligent Citizen). Next step was the implementation of the web tool for data survey that the model needs for its validation through a pilot [14]. The experience of applying a pilot to a small set of seven PAs in three Latin American countries, gave the base to assume the weaknesses detected in the diagnosis of these PAs, and propose the actions as a guide to reach level three of maturity, or very close to it [15].

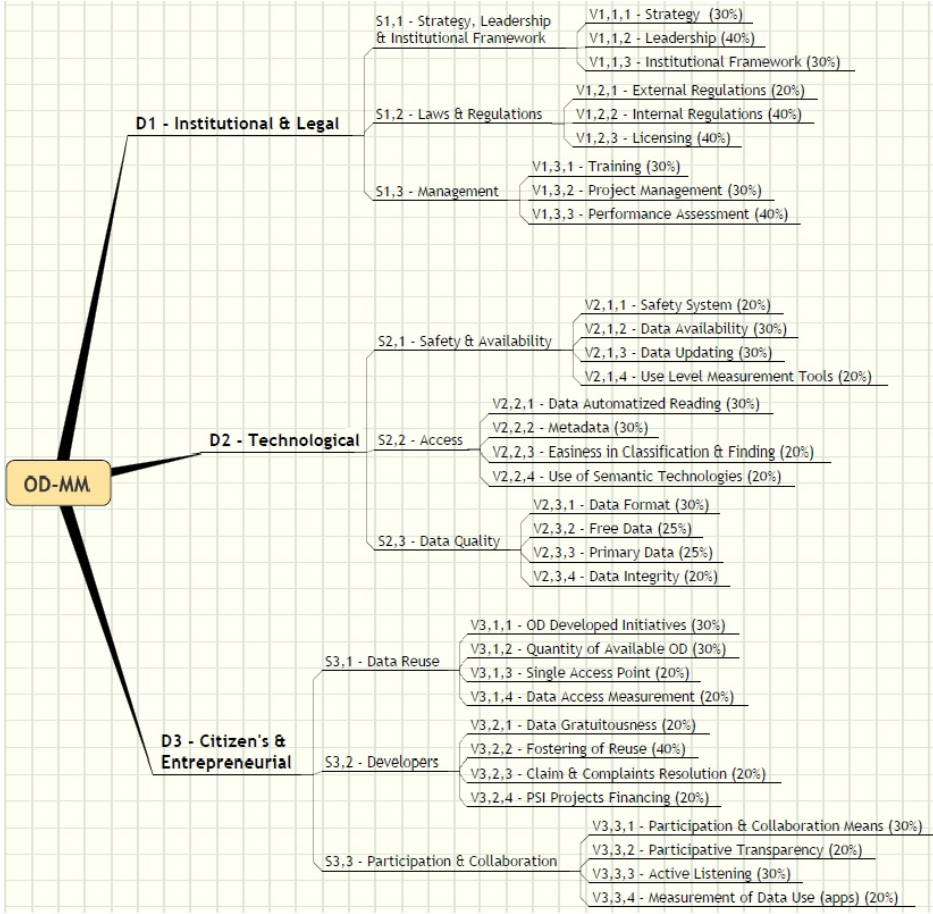


Figure 1. Hierarchical OGD: Domains, subdomains and weighted variables

1.1. Capacity Level (CL) of Variables and Subdomains

Weights (w_{ijk}) of variables (V_{ijk}) for OD-MM model, determined by means of a methodology detailed in [9], allowed to establish the weight for each subdomain. Thus, the capacity level (CL) of a subdomain S_{ij} turns out to be a weighted sum (w_{ijk}) of their constituent CL variables (V_{ijk}), according to Equation 1.

$$CL(S_{ij}) = \left[\sum_{k=1}^n CL(V_{ijk}) \times w_{ijk} / 100 \right] \quad (1)$$

Figure 1 shows the weight of every variable in each subdomain of the defined domains. In this way, 100% of a subdomain weight is distributed among the variables it is composed of, i.e., *External Regulations* ($V_{1,2,1}$ with weight $w_{1,2,1}=20\%$), *Internal Regulations* ($V_{1,2,2}$ with weight $w_{1,2,2}=40\%$), and *Licensing* ($V_{1,2,3}$ with weight $w_{1,2,3}=40\%$).

1.2. Organizational Maturity Level (ML)

For each subdomain an incremental measurement scale exists based on a score from 1 to 4. This scale is associated with a generic qualitative capacity model described below.

Level 1: Inexistent Capacities

- Capabilities do not exist or the subdomain is approached in an ad-hoc and reactive manner, tends to be applied on an individual case by case way.
- There is evidence that the subdomains are recognized and need to be approached.

Level 2: Emerging Capacities (informal)

- An intuitive regular pattern to approach the subdomains is followed. Different people follow similar procedures to approach the same task.
- There is no formal training or divulgation of procedures, and responsibility to follow them up rests on each individual.

Level 3: Existent Capacities (formal)

- The procedures related to the subdomains are defined, documented and communicated.
- There is a formal training to support specific initiatives related to subdomains.
- Procedures are not sophisticated; they rather are the formalization of existing practices.
- Monitoring and measuring of compliance with procedures is possible, as well as taking actions when the apparent subdomains do not effectively work.
- Standards and guidelines established apply throughout the whole organization.

Level 4: Advanced Capacities

- Procedures have reached the level of best practices and continuous improvement is applied.
- The use of standard or world-class tools helps to optimizing the subdomains.

Table 2 shows the sets of priority subdomains used to obtain the organization maturity as from subdomains capacity level (*CL*). The advantage of this mechanism is its flexibility, since it only establishes a minimum group of subdomains, important in a given maturity level (*ML*). Country-wide, it allows regulating progresses according to an OGD national strategy, while the rest of subdomains are left to the discretion of the own organization. In this way, a PA will be in *ML* two if only if all the five subdomains (according to Table 2) are in *CL* two (i.e. $S_{1,3}$ - *Management*; $S_{2,2}$ - *Access*; $S_{3,1}$ - *Data Reuse*; $S_{3,2}$ - *Developers*; and $S_{3,3}$ - *Participation & Collaboration*). It doesn't matter in which *CL* are the other subdomains, this PA will be in *ML* two, but if any of these five subdomains is in *CL* one, then the *ML* of this PA goes immediately to one.

Table 2. Organizational maturity estimation based on a set of priority subdomains

S_{ij}	ML 2	ML 3	ML 4
$S_{1,1}$		2	3
$S_{1,2}$		3	4
$S_{1,3}$	2	3	4
$S_{2,1}$		2	3
$S_{2,2}$	2	3	4
$S_{2,3}$		2	3
$S_{3,1}$	2	3	4
$S_{3,2}$	2	3	4
$S_{3,3}$	2	3	4

2. Pilot Study

2.1. Pilot Sample

Ten PAs participated in a sampling of the pilot validation of the proposed model, in three countries that attended and validated the OD-MM model design. From these ten PAs invited in Chile, Colombia, and El Salvador, seven responded to the pilot.

2.2. Pilot Results

Table 3 shows the results of a survey carried out between January and March 2012, in which attendees answered a web questionnaire, according to its role in each of the three domains. This table displays also the capacity levels by subdomain, in each of the PAs taking part in it. Applying Equation 1 in each PA made possible to obtain the *CL* value by subdomain. Six of the participant PAs responded three areas (PA6 was the exception, responding only one domain, the Technological one). The last column shows the *CL* average in the PAs by subdomain.

Capacity values emphasized in grey color show they are higher than the average of the subdomain; this is a way to highlighting these extreme cases. On one side, the average of subdomain *Developers* is 1.7, and four PAs have a higher *CL* than that average. The case of PA2 stands out, since its assessment in this subdomain is the lowest as institution. Not a single PA is in level three or four of capacity, which coincides with present circumstances.

At the other end are those subdomains (*Management* and *Access*) with only one PA above the average (PA2). All the others are below the average. In the case of *Management*, all PAs are in level one, with the exception of PA2 which is in level two; although its evaluation is the lowest, it is the highest one in the group.

Subdomains *Participation & Collaboration*, and *Access* are the only subdomains with greater dispersion, with levels of assessment between 1 and 4. In the case of *Participation & Collaboration*, three PAs obtained level 1; one obtained level 2, and two obtained level 4. In the case of *Access*, one solely PA obtained level 1, four of

them obtained level 2, and only one got level 4. We believe that these subdomain variables (*Participation & Collaboration Means*; *Participative Transparency*; *Active Listening*; and *Measurement of Data Use-applications*) were misunderstood, since dispersion does not fit to the reality observed.

Table 3. CL of subdomains for PAs participating in the pilot

Domain	Subdomain	PA1	PA2	PA3	PA4	PA5	PA7	CL_{SD}
Institutional & Legal	Strategy, Leader & Inst. Framework	3	3	1	3	1	2	2.2
	Laws & Regulations	2	3	1	2	1	1	1.7
	Management	1	2	1	1	1	1	1.2
Domain Average		2.0	2.7	1.0	2.0	1.0	1.3	
Technological	Safety & Availability	2	3	2	2	3	2	2.3
	Access	2	4	1	2	2	2	2.2
	Data Quality	2	3	2	3	2	1	2.2
	Domain Average	2.0	3.3	1.7	2.3	2.3	1.7	
Citizen's & Entrepreneurial	Data Reuse	2	3	1	2	1	1	1.7
	Developers	1	2	2	2	1	2	1.7
	Participation & Collaboration	1	4	1	4	2	1	2.2
	Domain Average	1.3	3.0	1.3	2.7	1.3	1.3	
Average by PA		1.8	3.0	1.3	2.3	1.6	1.4	1.9

Table 3 shows each domain simple average by PA. In all cases, this average is always above or equal to the respective *CL* domain in that PA. In case of PA2, was the only PA obtaining a level 2 of institutional maturity, observations point out that its domains averages 2.7 (*Institutional & Legal*), 3.3 (*Technological*), and 3.0 (*Citizen's & Entrepreneurial*). These results provide a global average of 3.0; that is to say, with a 100% compliance for level three of maturity, but when applying the pattern of the Table 2, the institution remains in *ML* two.

Carrying out this same analysis for PA4, it is observed that all subdomains have a simple average above or equal to 2, namely 2.0 (*Institutional & Legal*), 2.3 (*Technological*), and 2.7 (*Citizen's & Entrepreneurial*), but when applying compliance pattern of Table 2, PA4 reaches a level one of maturity. However, to reach *ML* two (Table 2), it should only evolve one level in subdomain *Management*.

Table 3 indicates the capacity average value in each subdomain for the PA representative portion that participated in the pilot of the model and the web tool. The most developed subdomain is *Safety & Availability*. This result matches with the emphasis made generally by governments, in having IT infrastructure available, since all subdomains of the *Technological* domain (*Safety & Availability*; *Access*; and *Data Quality*) are better-developed than other subdomains [14].

The less-developed subdomain is *Management*. This result allows suggesting the hypothesis that the efforts to introduce OGD in PA do not coincide with formalization of internal processes, development of human capital required and performance assessments. This usually results in inefficient uses of financial resources and additional effort of human capital. Another element to consider is that the average value of all subdomains does not reach level three (Existent).

3. Roadmap Generation

OD-MM model application allows knowing the diagnosis of a PA, but it also proposes improvement instances on these matters (roadmaps). That is to say, it offers an orientation to objectively canalizing financial and human capital resources of an organization that needs to improve its capacities to carry out OGD initiatives. A roadmap should be optimal in relation to the effort required by a PA to achieve a higher *ML*, i.e. it should give a path that represents the lesser effort to the PA. The roadmap to be generated must meet the following requirements:

- Comply with restrictions on the configuration of priority subdomains in Table 2.
- The smallest possible increase of variables to deliver an optimal solution with the least possible effort.

For the latter condition is defined that the variable to be increased should be as important as possible, so that the choice of the candidate variable to improve is as follows:

- A variable is chosen with the lowest *CL*.
- A variable is chosen with the highest weight.

The first constraint above ensures that the evaluated PA will improve its weakest points, in addition to the least possible effort. It is understood that to increase a *CL* of a variable from i to $i+1$ represents a less effort than increasing the *CL* of the same variable from $i+1$ to $i+2$, due to a higher *ML* demands a greater effort. The algorithm to generate the roadmap sorts the set of variables V_{ij} in ascending order according to their capacities. In this way, the operation *Get* a variable from that set, will return the variable with the lowest *CL* (Figure 2).

The second constraint ensures that the most important variables are those that must be met first. Each variable has a weight representing its importance within the subdomain. Due the way in which the *ML* of a PA is calculated, increasing the *CL* of a variable with a weight of 40 % is the same as increasing the *CL* of two variables with a weight of 20 % each, but increases of one variable means less effort than increasing two variables for the PA. In this way, if there are two or more variables with equal *CL*, the algorithm in Figure 2 sorts these variables in descending order according to their weights.

If you have two or more variables candidates to choose from, and as you want to increase the value of one of these, you can select one at random, as they have the same level and weight there is no way to know which of these is more important or represents a lower effort to PAs.

Table 4 describes the variable *Project Management* to all capacity levels. The selection carried out by PA2 for variables *Project Management* (bolded in Table 4) and *Performance Assessment* was level 2, and level 3 for variable *Training*. When applying Equation 1, calculation of weighted sum of variables for subdomain $S_{1,3}$ - *Management*, the result of Equation 2 shows that $S_{1,3}$ is in a *CL* 2, but has a 30% capability from the third level, therefore, an optimum *roadmap* must increase the *CL* of the subdomain in a 70% and not in a 100%.

$$CL(S_{1,3}) = \frac{2*40 + 2*30 + 3*30}{100} = \frac{230}{100} = 2.3 \quad (2)$$

Algorithm Roadmap Generator($CL(V_{ijk})$ of PA)

begin

For each subdomain S_{ij} calculate

$$CL(S_{ij}) = \left\lfloor \sum_{k=1}^n CL(V_{ijk}) \times w_{ijk} / 100 \right\rfloor$$

$m = ML$ according configuration of $CL(S_{ij})$; $m = (1, 2, 3, 4)$

if ($m == 4$)

then No Roadmap is required

else

begin; generation of roadmap from ML m to ML $m+1$

repeat

S_{ij} S / $CL(S_{ij})$ less than required in ML $m+1$ (Table 2)

/* S : set of all subdomains S_{ij} needing improve

V_{ijk} V_{ij} / $CL(V_{ijk})$ less than required in ML $m+1$ (Eq. 2)

/* V_{ij} : set of all variables V_{ijk} S_{ij} needing improve

Sort V_{ij} in ascending order of $CL(V_{ijk})$

if (there are V_{ijk} with the same CL)

then Sort V_{ij} in descending order of w_{ijk}

repeat

Get a S_{ij} S and remove it from S

repeat

Get a V_{ijk} V_{ij} and remove it from V_{ij}

Increase CL of V_{ijk}

until $V_{ij} == \emptyset$ or $CL(S_{ij})$ is achieved

until $S == \emptyset$

until ML $m+1$ is achieved

Generate Roadmap with augmented variables

end

end.

Figure 2. Algorithm to generate an optimal roadmap

If the institution has ML 2, then the roadmap generated points out to achieving capacities of ML 3, and from ML 3 is generated a roadmap to ML 4 that belongs to Advanced Capacities. From Table 2, PA2 postulates to institutional ML 2, since when *Management* subdomain is in CL 2, it does not reach institutional ML 3. Table 3 shows that subdomain *Strategy, Leadership, & Institutional Framework* has a CL 3, which exceeds the requirement in reference level for ML 3 in Table 2. *Laws & Regulations* meets with the CL required for ML 3, and *Management* must improve its CL from 2 to 3, in order to reach ML 3 as institution.

The generated roadmap is equivalent to the elements recommended to develop in the institution the capacities to reach ML 3. In this case, these recommendations are directly obtained from the descriptions of CL 3 of variable Project Management in Table 4.

Table 4. CL description of variable “Project Management”

CL	Variable: <i>Project Management (30%)</i>
Level 1	Although its importance is recognized, management of these projects is only according to specific skills of the Project Director on duty.
Level 2	Only certain projects have been managed with established procedures.
Level 3	A PMO (Project Management Office) exists that ensures the compliance of standard procedures when managing all OGD projects of an organization. Alignment of projects considers business targets.
Level 4	Carry out systematically specific training in Project management. The organization has a PMO using market standards such as those proposed by Project Management Body of Knowledge of PMI (Project Management Institute) or other equivalent. The organization has special care of cautioning that OGD principles do absorb other related projects.

The roadmap generated to improve variable Project Management has the following recommendations:

- Manage projects with established procedures.
- Create a PMO to ensure compliance of standard procedures in all OGD projects management.
- Align projects with business target.

The experience of having a diagnosis and its respective roadmap in each PA, allow to propose an OGD implementation guide to assume weaknesses detected in the diagnosis of PAs [14]. Therefore, when following the actions proposed by the guide in [15], institutions will reach level 3 of maturity, or very close to it (from a maximum of 4), for sure.

4. Conclusions

The OD-MM approach, model, and web tool grant several contributions to the adoption and improvement of OGD implementation in public agencies:

- It is the first especially developed model used as a basis by developing countries.
- It allows PAs to carry out a self-assessment through a web-based tool for simplicity and wider availability. None of the other models has this feature present.
- Simple and fast to use, since self-assessment tool does not require special technology training, and is freely available.
- Each application of the model automatically generates a roadmap with recommendations to evolve to higher maturity level.

Acknowledgements

The authors would like to thank Gonzalo Valdes, Gastón Concha, Cristián Torres, Luis Meijueiro 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).

References

- [1] Harrison, T.; Guerrero, S.; Burke, G.B.; Cook, M.; Cresswell, A.; Helbig, N.; Hrdinová, J.; Pardo, T. Open government and e-government: Democratic challenges from a public value perspective. *Inf. Polity* 2012, 17, 1–15.
- [2] Lathrup D. and Rume L.: *Open Government: Collaboration, Transparency, and Participation in Practice*. O'Really Media: Sebastopol, CA, USA, 2010. 432p.
- [3] Opengovdata. 2008. Eight principles of open government data. [ONLINE] Available at: <http://www.opengovdata.org/home/8principles>. [Accessed 09 June 14]
- [4] Tim Berners-Lee. 2011. 5 Open Data. [ONLINE] Available at: <http://5stardata.info/>. [Accessed 09 June 14].
- [5] Gartner. 2010. Gartner Open Government Maturity Model. [ONLINE] Available at: <https://www.gartner.com/doc/1390447>. [Accessed 09 June 14].
- [6] Mark Yates. 2011. Business Strategy: Smart Government Maturity Model – Open Data and Collaboration in Central and Eastern Europe. [ONLINE] Available at: <http://www.idc.com/getdoc.jsp?containerId=CEMA18048>. [Accessed 09 June 14].
- [7] The World Bank. 2013. Open Government Data Toolkit . [ONLINE] Available at: <http://data.worldbank.org/open-government-data-toolkit>. [Accessed 09 June 14].
- [8] Kalampokis, E., Tambouris, E., & Tarabanis, K.: Open Government Data: A Stage Model. *Lecture Notes in Computer Science* 6846, 2011, pp 235-246.
- [9] Solar, M., Concha, G. & Meijueiro, L.: A Model to Assess Open Government Data in Public Agencies, in. H.J. Scholl et al. (Eds.): EGOV 2012, *Lecture Notes in Computer Science* 7443, 2012, pp. 210–221.
- [10] Reggy, L.: Benchmarking Open Data Availability across Europe: The Case of EU Structural Funds. *European Journal of ePractice* : www.epracticejournal.eu N° 12, March/April. 2011.
- [11] Dan Morgan. 2010. Gartner Open Toward an Open Data Maturity Model. [ONLINE] Available at: <http://www.govloop.com/profiles/blogs/toward-an-open-data-maturity>. [Accessed 09 June 14].
- [12] Lee, G. & Kwak, Y.H.: An Open Government Maturity Model for Social Media-based Public Engagement. *Government Information Quarterly* 29, 2012, pp. 492-503.
- [13] MELODA. 2010. METHodoLOgy for assessing open DAta sources. [ONLINE] Available at: <http://www.meloda.org/>. [Accessed 09 June 14].
- [14] Solar, M., Daniels, F., Lopez, R. & Meijueiro, L.: Identifying Weaknesses for Latin American Open Data Implementation in Public Agencies. in Álvarez, L. and Anido, L. (Eds.): MeTTeG 13. *7th Int. Conf. on Methodologies, Technologies and Tools enabling e-Government*. University of Vigo, Spain. pp. 219 – 228. Oct 17-18, 2013.
- [15] Solar, M., Meijueiro, L. & Daniels, F.: A Guide to Implement Open Data in Public Agencies, in M.A. Wimmer, M. Janssen and H.J. Scholl (Eds.): EGOV 2013, *Lecture Notes in Computer Science* 8074, 2013, pp. 75–86.

Generic data models for Semantic e-Government interoperability: Literature Review

Katariina Ryhänen^{a,1}, Tero Päivärinta^b, and Pasi Tyrväinen^c

^a*Department of Computer Science and Information Systems, University of Jyväskylä, Finland*

^b*Luleå University of Technology, Sweden*

^c*Agora Center, University of Jyväskylä, Finland*

Abstract. Interoperability of e-government systems is suggested to increase transparency, efficiency, effectiveness, and customer service in the public sector. Generic data models are often seen as a way for achieving especially semantic interoperability. To assess how the contemporary data models support semantic e-government interoperability, we reviewed literature on data models suggested for the public sector in light of four features: standard modelling language, entity-relationship modelling, vocabulary for data exchange and methodology. The review contributes previous research by introducing a four-feature framework for assessing capability of e-government data models to enhance interoperability and by providing an up-to-date review of the generic data models for this purpose.

Keywords. Data Model, Information Model, Interoperability, Public Administration

Introduction

E-government and electronic governmental services require good information system interoperability, which increases government transparency, efficiency, effectiveness, co-operation and information exchange among governmental organizations [8, 10]. Also, positive effects on service quality for citizens and other stakeholders are mentioned [29, 30]. European Interoperability Framework (EIF) defines the concept of interoperability as the ability of disparate and diverse organizations to interact towards mutually beneficial common goals, including the sharing of information and knowledge between the organizations, through the business processes they support, by exchanging data between their respective ICT systems [8].

Moreover, in the context of public administration, EIF describes four interoperability levels: legal interoperability, organizational interoperability, semantic interoperability and technical interoperability [8]. However, two recent studies [10, 30]

¹ Katariina Ryhänen, University of Jyväskylä, Finland, katariina.ryhanen@luukku.com

reviewed public administration interoperability initiatives and denoted the lack of common conceptual frameworks and interoperability success factors.

In this paper, we aim for shedding more light on the issue of semantic interoperability. In semantic level, interoperability is pursued by the meaning of data elements and the relationships between them [8]. One way to ensure semantic interoperability is to create a common information model which defines the central concepts, their attributes and relations [15]. In this paper, information model is seen as a representation of entities, attributes and relationships among entities. It is independent from physical implementation, and it should be developed using a formal modelling language [18].

When analyzing how data models can enhance semantic interoperability, it is important to further determine the types of data models. In [25], Peristeras et al. reviewed the model-driven initiatives for public administration interoperability. They have divided the model-driven initiatives into three categories: Data initiatives (focusing on object/entity modeling), process/service initiatives (focusing on process and service modeling) and organizational modelling (modeling organizational issues). However, we need to update this information in part of the data initiatives, searching for the latest generic data models and assessing how they support the semantic interoperability of public administration.

In this paper, the focus is on generic data models, because of their wide utilization possibilities. According to Peristeras et al. [25], a generic data model is an abstract model that covers the overall public administration domain. They can also serve as a basis for conducting lower level or domain specific models, such as Geographic Information Systems (GIS) [1] in the technical domain and Health Level Seven (HL7) [6] in the health care domain. However, these domain specific models are not included in this review, because of their more limited generalization possibilities in organizational level.

According to Peristeras et al. [25], data models can also be defined with regard to their application scopes, and can act as a the basis for either a single information system, a number of domain information systems, or as a basis for whole organizations' information systems. Accordingly, the authors have defined three scopes for data model scalability: 1) Global, 2) National and 3) Sub-domain level (e.g. ministry or local authority). The global level means that data models can be applicable and reusable across different countries, the national level refers to applicability within one country. Sub-domain level means that a data model is applicable inside one organization.

Based on the knowledge presented above, our review addresses the following research question:

1. How do the generic data models found support the interoperability of public administration in sub-domain, national and in global level?

The article is structured as follows. Review scope and process is presented in section 1 and section 2 establishes four success factors to analyze how existing generic data models can enhance semantic interoperability. The results of this review are presented in section 3 and finally, section 4 discusses the research contributions and outlines possible avenues for further research.

1. Review Scope and Process

This literature review focused on generic data models for public administration, encompassing both government and municipality organizations. These data models could be developed for the use of one organization or multiple organizations, nationally or globally. Actual use experiences were not required. We followed the review in following:

Identifying the purpose of the literature review: The topic and the purpose of this review address the area of interoperability in public administration. The interest is especially in semantic interoperability – How the current generic data models are able to support this interoperability area. For evaluating this, we generated four-feature framework to assess the specific features which are assumed to have a positive effect on semantic interoperability.

Forming clear research protocol: This phase documents the research stages in detailed level, and provides instructions for searching, screening, extraction and synthesis. As a part of this phase and also for identifying the data models which are genuinely applicable for more than one operational area in public sector organization, we formed content criteria for analyzing the content of the papers: 1) Data model is a generic data model, 2) Data model is developed for public administration, 3) Data model is developed to support either one organization or multiple organizations nationally or globally.

We used the key concepts and their combinations as search terms. Moreover, we limited our search to academically reported material and chose academic databases for literature searches based on the topic of the database (information technology) and also for the commonness of database. The chosen databases were IEEE Xplore, SCOPUS (Elsevier) and ACM Digital Library. In addition, Google Scholar was used for complementing the search results.

Searching for the literature: The search terms used were “interoperability” AND (“information model” OR “data model”) AND (“public sector” or “government” or “e-government” or “eGovernment” or “municipality” or “public administration”). The publication year range was limited to 1980-2013 and the searches were conducted for all contents, both metadata and content. Document type was restricted to peer-reviewed conference publications and journal articles, paper length at least 6 pages. Moreover, language of the papers was limited to English. Because of the large number of database hits in several search terms, we had to limit the practical screening to concern no more than hundred articles per search. Results of the queries are presented in Table 1.

Table 1. Search Results Overview

Academic databases and search engine	Hits in total	Relevant based on practical screening	Relevant based on quality appraisal
IEEE Xplore – IEEE/IEE Electronic Library	1	1	0
Scopus (Elsevier)	208	16	4
ACM Digital Library	290	9	2
Google Scholar	42	8	1
Hits in total	541	34	7

In *Practical screening* we reviewed the suitability of title and abstract against the content criteria. If the paper met each criterion, it was selected for quality appraisal. During this phase, the notable decrease in the number of papers was mainly due to first point of content criteria; the data model had to be general and thus not domain-specific. Consequently, data models generated for example for health care or geographic information purposes were not taken into a further observation.

During the *quality appraisal*, we observed the quality of the articles which passed the previous phase. At first, we ensured that articles certainly met the content criteria. This was already observed in practical screening, but also verified here. Secondly, we ensured that the preconditions described in Searching for literature phase (e.g. requirement for paper peer-reviewing, minimum page amount) were met. Hence, separate scoring of the methodological quality was not conducted [22]. While examining the papers which passed the quality appraisal, we also discovered original sources and in this way enriched and complemented our selection of literature.

Data extraction phase was conducted by analyzing each article. During the data extraction, we assessed how the data models found supported the interoperability aims of public administration organization. In the *synthesis phase*, we conducted the conclusions, assessed how the research question could be answered and finally deduced some possible implications for future research. The review was written in parallel with each of the previous stages.

2. Four-feature Framework for Assessing Semantic Interoperability

Based on the literature review, we assessed the features of found data models, which are reported to have positive influence on interoperability, standardization and utilization of existing standards are highlighted in several studies [2, 3, 8, 11, 27, 29, 30]. Furthermore, the importance of organizational issues over technical ones is proposed in [16, 29]. In opposite to these advancing factors, also some constraints for interoperability have been reported in research by Scholl & Klischewski [29].

Scholl & Klischewski [29] created a research framework for e-government integration and interoperation. In this framework, they stressed the importance of success factors in integration and interoperation, especially as implications for future research. In their later study [30], the authors utilized the framework by studying several interoperability initiatives in their research project. As a result, they discovered that the lack of interoperability success factors and metrics was still prominent. Also Flak & Solli-Saether stated in [10], that interoperability as a research area lacks a common conceptual framework and thus the understanding of the factors that constitute interoperability is still vague. Altogether, we seem to have a clear gap in current research concerning the interoperability success factors. In this review, we try to address this research gap especially in part of semantic interoperability. For this purpose, we analyzed the existing literature and conducted four features of generic data models, which are based on the literature stated to have positive effect on public administration interoperability, especially on semantic interoperability. These features are:

1. *Using standard modeling language or notation*, enhancing interoperability through common understanding of processes and related information [3, 8, 11, 17, 27, 30, 31]

2. *Modeling and describing relationships between entities*, enhancing interoperability by describing entities and their structures [8, 25]
3. *A separate vocabulary to describe data exchanges*, influencing interoperability by ensuring agreed values or terms are used and they follow a specific format or pattern [5, 8]
4. *Agreed procedures and methodologies for developing generic data models or other interoperability assets*, influencing interoperability by ensuring the correct understanding and utilization of data models through specific instructions [8].

In addition, the importance of organizational issues was brought up in several studies [10, 16, 30], but we did not find enough evidence or exact definitions from the literature for including this factor in our framework. In this review, we analyzed the generic data models found in light of the above criteria (four-feature framework).

3. Results

The results of this review are divided into 1) an overview of the generic data models found, 2) analysis in light of the four features as defined above and 3) a summary of the findings.

3.1. *Generic Data Models*

To aid the examining of the data models found, we divided the models into two main groups. First group is national and sub-domain data models, which are developed for the purposes of one country or one organization. Although they are often developed from the viewpoint of a single interest group, they are often based on some other general data or information model or an interoperability framework [8, 23]. Moreover, some of the models intended mainly national, are used as a backbone of some other national models. The second group is global data models, which are developed for the use of multiple governmental organizations world-wide.

Under these two categories, we further divided the data models into three categories, based on their properties and representation style. First sub-category is ER-based initiatives, which are often represented for example using UML notation. The second sub-category is metadata initiatives, which are mostly based on Dublin Core metadata model [25]. According to Shukair et al. [31], several countries have their own standard for metadata descriptions, often based on Dublin Core. The third identified group is ontologies which are intended to support interoperability aims by assuring semantic compatibility [26]. Ontologies are often represented in a standard machine understandable language, like OWL (Ontology Web Language) which is a standard and recommendable language developed by W3C [33]. OWL has also a set of sublanguages intended for other levels of complexity [27].

The next table (Table 2) presents the found data models in general level, providing further references for more detailed information:

Table 2. *Summary of the found data models*

Data model	Description
ER-based initiatives:	
UK Government Common Information Model (GCIM) [21, 25]	ER-based high level data model for all public administration's activities. It is a part of the UK e-Service Development Framework. The model emphasizes the concept of interaction [21, 25].
Federal Enterprise Architecture (FEA) [32]	FEA is a framework for federal government, developed in United States by the Office of Management and Budget's, Office of E-Government and Information Technology. FEA is strongly a business-driven model [32].
The Governance Enterprise Architecture (GEA) [24]	GEA is a technology neutral model which describes the business context and the business relationships of public administration domain. It is a top-down model consisting of two mega-processes: Public Policy Formulation and Service Provision [25].
Fidis [9]	FIDIS (Future of Identity in an Information Society) is an excellence group funded by the European Union's 6th framework programme. They concentrate mainly on identity management and from this point of view; they have also formed a development method and a framework for interoperability of information systems. Among the other deliverables, FIDIS provides best practice guidelines to incorporate the development method and framework into practice. The method and its framework are divided into four domains, like the business modelling domain, described in ER modelling language [9].
Metadata initiatives:	
Dublin Core metadata model and Dublin Core-based metadata models [5]	Dublin Core is one of the most influential and domain independent metadata standard managed by the Dublin Core Metadata Initiative (DFMI) [3]. Dublin Core-based e-GMS standard for metadata management (e-Government Unit, 2006) and it is developed as a part of e-GIF Framework. E-GMS describe several metadata elements and their level of obligation, aiming to support information resource discovery, management and digital preservation [7].
ISO 11179-based metadata models [14]	ISO 11179 is a standard for metadata registries. Metadata registries address the issues like the semantics of data, representations of data and the registrations of the data descriptions. According to Shukair et al. [31], two notable examples of ISO-based metadata models are DESIRE [12] and CORES [13].
Ontologies:	
Knowledge management system [28]	A web-based knowledge management system which aids the service provision. The main component of their system is a knowledge portal, which consist of two components: public administration ontology and RDF metadata repository [28].
The Dip eGovernment Ontology [4]	A domain ontology for public administration, using Operational Conceptual Modelling Language (OCML). The ontology models a wide range of information and services, although, its deficiency is that it is stated to be only a taxonomy, not a thoroughbred ontology [4, 25].
WebDG Ontologies [20, 25]	WebDG Ontologies have been developed in Computer Department of Virginia Tech, as part of Web Digital Government project. The ontology is centered on two main features: composing e-government services and ensuring privacy of the services [20, 25].
A semantic framework for Public Administration services [27]	In this framework, Life Event (LE) is a central concept, in orchestrating one-stop government services [27].

Public Service Ontology [19]	Public Service Ontology was developed with the primary goal of providing a standardized, formal, unambiguous, reusable and extendable way of presenting public services [19].
------------------------------	---

3.2. Data Model Support for Interoperability

We analyzed the data models against the four features to see how each model supports semantic interoperability. In addition, we evaluated the differences between the national and global data models in supporting these interoperability features.

Support for using standard modelling language or notation: To enable interoperability, use of standard language or notation is often seen important [3, 8, 11, 27, 29, 30]. According to Benguria and Larrucea [2], the proliferation of different standards and formats is the main barrier for interoperability between organizations. When observing the found data models against this feature, only GCIM and GEA models have considered this aspect. Both of the models are ER-based, however GCIM's ER orientation is much stronger. GCIM is an object based model, with the strong idea of reusing general elements and patterns, avoiding reinventing the wheel [20]. GCIM provides a wide variety of ready-made diagrams to employ, like use cases, activity diagrams and class diagrams. The notations are explained in detailed level which aids the utilization of ready elements and patterns even more.

The viewpoint in GEA is more on processes, and it doesn't provide as wide support for modelling initiatives than GCIM. GEA also utilizes GCIM and broadens it by including the knowledge aspect into the public administration domain model. Authors have also made some adjustments to presented objects [24]. In ER-based models, FEA also includes a data model in UML notation, but it is considered more as an abstract data model, without any concrete examples of public administration domain. This is why FEA model is considered not to possess support for using standard modelling language or notation.

Support for modelling and describing relationships between entities: All the observed data models described the relationships between different entities, although in different manners. ER-based models described the relationships by using both graphic and textual illustrations, whereas metadata models and ontologies described the relationships by textual means. In metadata models, relationships were often modelled also in related XML or RDF schemas [13]. In addition, the following two ontologies modelled the relationships with the help of the OWL (Ontology Web Language): Knowledge management system [28] and semantic framework for public administration services [27]. Although, this article criticized OWL for some shortcomings in modelling relations [27].

The DIP eGovernment Ontology presents the relationships by describing the classes, subclasses and inheritance of properties. Because The DIP eGovernment Ontology is mainly a taxonomy, the relationships are described only in a superficial manner. In this review, we do not evaluate which way of describing the relationships is the most descriptive and useful, they are considered as equal.

Support for separate vocabulary to describe data exchanges: For supporting the semantic interoperability, the existence of separate vocabularies or data dictionaries

to describe data exchanges is seen as an important attribute [8]. GCIM includes a specific vocabulary in which the key terms of the model are described. Also in the viewpoint of technical implementation, GCIM has code sets and related vocabularies as reusable resources. GEA and FEA models recognize also a vocabulary and in GEA, the viewpoint is mostly technical implementation. In ER-based models, FIDIS is the only model which does not include a separate vocabulary.

In metadata models, vocabularies are usually expressed in vocabulary encoding schemes, where values for the data elements are from controlled vocabularies (e.g. ADLS, e-GMS, Desire, Cores, Canadian metadata model). A data element can be for example a class, a property, a vocabulary encoding scheme or a syntax encoding scheme [5]. In addition to permitted values, encoding schemes ensure that the values conform to a specific format or pattern. An RDF schema can be used to describe a vocabulary, using an RDF Vocabulary Description Language which is the case in DESIRE and CORES models. Dublin Core metadata model has defined a DCMI Type Vocabulary to categorize the nature or genre of the resource. This is done with the help of the set of classes specified in the DCMI Type Vocabulary.

Although both ER-based and metadata models are using vocabularies to obtain semantic interoperability, they are pursuing it by using different approaches. Whereas in ER-based models vocabularies are often in appendixes or in other list-based files describing the exact meaning of a specific term, metadata models are using vocabularies to ensure that the right values are given to the elements.

Ontologies are considered essential in the area of e-government, as they state an agreement to adapt a specific vocabulary in a coherent and consistent manner. Ontology can also be understood as a vocabulary itself [4].

Support for agreed procedures and methodologies: In this review, with support for agreed procedures and methodologies we mean that a data model includes some instructions to guide the utilization of the data model. Instructions can be either textual descriptions, a numerated list of development phases, or formal and reusable models, like various diagrams. GCIM model aids the developers by providing a preferable order for GCIM classes and separate descriptions for each class. There are also a separate checklist to go through, ensuring that all development phases are taken into consideration. Furthermore, common frameworks for each service interaction are provided. Another ER-based data modeling initiative that takes the agreed procedures and methodologies into account is GEA. GEA guides the development of a description of the overall governance system, by introducing the GEA object model for overall governance system. Authors stated that this model covers a path which leads from the conceptualization of administrative action to the realization and process execution in the real world [24].

In ontology-based data models, we consider that WebDG Ontologies includes the issue of providing support for agreed procedures or methodologies. This is due to in-depth descriptions of standards and technologies used in implementation, and a comprehensive WebDG architecture. Moreover, the issue of semantic composability is addressed. In addition to this ontology, Knowledge Management System [28] and Semantic Framework for Public Administration Services [27] also contains detailed implementation descriptions, so we consider also these data models as supportive for this interoperability feature.

Table 3. Generic data models, their sub-categories and support for interoperability

Scope of the data model	Sub-category of the data model	Using standard modeling language or notation	Modeling and describing relationships between entities	Separate vocabulary to describe data exchanges	Agreed procedures and methodologies
National data models:					
GCIM	ER-based initiatives	X	X	X	X
FEA	ER-based initiatives		X	X	
Dublin Core-based national metadata models	metadata initiatives		X	X	
Knowledge management system [28]	ontologies		X		X
Global data models:					
GEA	ER-based initiatives	X	X	X	X
FIDIS	ER-based initiatives		X		
Dublin Core metadata model	metadata initiatives		X	X	
ISO 11179-based global metadata models	metadata initiatives		X	X	
The Dip eGovernment Ontology	ontologies		X	X	
WebDG Ontologies	ontologies		X		X
A semantic framework for Public Administration services [27]	ontologies		X		X
Public Service Ontology	ontologies		X		

3.3. Findings

We aimed for discovering generic data models, which have a positive impact on public administration interoperability. Although we searched academic papers from three well-known databases and from one comprehensive search engine, among the 541 hits

we found only seven papers, which passed the quality appraisal phase (see Table 1). However, these papers led to the secondary sources in which additional generic data models were reported. The found data models are summarized in Table 2.

During the analysis of data models, we observed a total lack of papers describing data models in sub-domain level. This may be caused by the lack of motivation for single organizations to report their internal models and standards in academic resources, even if the organization is global. When combining our presentation categorization and the scope categorization we noticed that the amount of national and global data models is quite similar in ER-based initiatives. Several countries have their own metadata initiatives and thus, these are more popular in national context, although they are often based on a global standard, mostly in Dublin Core. In ontologies instead, there are more global models in use than national ones.

When analyzing the utilization of existing data models to create new ones, we noticed, that in addition to re-using existing models inside one sub-category (e.g. ER-based initiatives), there exist also utilization across these sub-category borders. For example, the origins of the Public Service Ontology are on the GEA model. Interestingly, ER-based models are reused more often than metadata or ontology initiatives. This might be due to their holistic nature, which makes them easier to apply in different contexts. Also, commonness of Dublin Core model as a background for both national metadata models and ISO 11179-based models is notable.

To support the analysis of the data models, this paper devised a four-feature framework for assessing capability of data models to enhance interoperability, based on synthesis of previous research. Table 3 summarizes the research results by mapping the individual data models (rows) against the supported interoperability feature (columns). Several observations can be made from this table. At first, ER-based models provide the highest level support for public administration interoperability. In line with the specific definition of information or data model [18], all the models support modeling and describing entities, while only ER models support standard modeling language or notation. GCIM and GEA models support each interoperability feature, while other data models support usually two of them. GCIM and GEA models are holistic models in their nature, and include several re-usable elements derived from business or process perspective. The GEA model is also partly based on GCIM, which explains their consistencies in some extent.

From the Table 3 we can also observe that metadata initiatives and ontologies supported quite similar interoperability features. This similarity may be due to the diagrammatic nature of these models as well as use of formal and machine understandable language that is not oriented towards support for organizational issues and support for using standard modelling language or notation. Metadata initiatives tend to support separate vocabulary to describe data exchanges, as they often expressed the vocabularies by using vocabulary encoding schemes. Ontologies supported better the agreed procedures and methodologies, due to their more formal nature and support for implementation issues. Especially WebDG ontology addressed this feature by using in-depth descriptions of standards and technologies used in implementation.

The technical orientation brings a significant advantage for ontologies, because they are often presented in machine-readable format and are therefore processable at runtime, reducing the chance to misuse or otherwise incorrectly interpret the data model.

In general, the second most supported interoperability feature was a separate vocabulary to support data exchanges. We considered the data model to support this

feature, if it offered a separate vocabulary for describing the semantics of specific terms used in the data model supporting appropriate data exchanges. The third most supported feature is the support for agreed procedures and methodologies. In ER-based data models, the specific modelling guidelines were offered, whereas ontologies included more implementation oriented guidelines. Support for using standard modelling language was rare and mainly taken into account in ER-based data models.

When comparing how the national and global data models support interoperability, we can perceive in Table 3, that there are no significant differences in ER-based models. A comprehensive ER-based model exists in both of these scopes, as GCIM is intended national and GEA as a global model. Also differences in metadata-based models and ontologies between the national and global scopes are minor leading to the conclusion, that there exist no significant differences in ways that national or global data models support interoperability in public administration. The research question is answered as follows:

1. How do the generic data models found support the interoperability of public administration in sub-domain, national and global level?

Unfortunately, not any sub-domain level data models were found in our literature review. Data models in national level supported the interoperability by modelling and describing the relationships between entities, either in UML-based notation (ER-based initiatives), RDF or XML schemas (metadata-initiatives), or in Ontology Web Language (ontologies). Several national data models also supported a separate vocabulary to describe data exchanges, either by textual descriptions or by using vocabulary encoding schemes, which was a common mean in metadata-initiatives. Support for other two features was pursued by the means of textual instructions and UML-diagrams, interrelated reference models and detailed descriptions about the implementation.

In global level, interoperability is mainly supported through modelling relationships between entities and by separate vocabularies to support data exchanges. In this level, there are several ontologies, which contribution to interoperability of public administration is both in implementing semantics and assuring the accuracy of technical issues. Altogether, because of the early stated cross-utilization of the presented data models, the means for supporting interoperability initiatives are quite similar between national and global data models.

In summary, there are no significant differences between national and global data models in the way they support interoperability. Therefore, this categorization of data model scalability [25] didn't provide any additional value in this research context. However, it is noteworthy that there are notable divergences between the different sub-categories of data models and how they support interoperability initiatives. Based on the results of this review, it can be noted that ER-based data models supported our four features of generic data models in most comprehensive way, regardless of the their scope or application area.

4. Discussion and Implications for Future Research

The purpose of this study was to complement the widely studied interoperability research area by evaluating, how generic data models in different scopes support

interoperability in public administration. In addition to generic data models found in [27], we complement this review by adding other data models introduced in the literature and further enriched the existing analysis by investigating how the evaluated models support interoperability objectives. The first contribution of this paper thus is the up-to-date review of the generic data models.

In addition, we devised a four-feature framework for assessing the capability of data models to enhance interoperability, derived from current interoperability literature. This is a response to the lack of interoperability success factors stated by Scholl et al. in [30]. Moreover, Flak & Solli-Saether noted in their research [10], that the evaluation of interoperability has been given only a little emphasis in previous studies. According to them, this might be due to the complex nature of public administration, which causes difficulties in applying traditional performance metrics. They constructed a conceptual model for interoperability, which included also three evaluation categories for interoperability: Technical quality, organizational performance and regulatory compliance. Compared to our four-feature framework, the categories presented by Flak & Solli-Saether in [10] are applicable for interoperability on a general level. In turn, our features are limited to data models. Hence, our four-feature framework complements the research of Flak & Solli-Saether [10].

Our findings indicate, that there are no significant differences between national and global data models in way they support interoperability. More specifically, the results of this review indicate that ER-based data models support the interoperability in a most comprehensive manner, and in this way they should be widely utilized in interoperability initiatives. To diminish the risk for misusing or interpreting the human-readable ER-based data models, ontologies can be used to complement ER models and aid the implementation stages.

For future research, we propose to further develop the conceptual model of Flak & Solli-Saether [10], by defining the evaluation approach cover also the four interoperability levels stated by European Commission in EIF [10]. This would also enable this model to better consider semantic interoperability. Another interesting area of future work would be sub-domain data models: In which extent they exist, in what data model they are based on, and how they support the interoperability of public administration.

References

- [1] Anselin, L. and Getis, A. Spatial statistical analysis and geographic information systems. Perspectives on spatial data analysis, *Advances in spatial science* (2010), 35-47.
- [2] Benguria, G. and Larrucea, X. Data model transformation for supporting interoperability. Sixth International IEEE Conference on Digital Object Identifier, (2007), 172-181.
- [3] Davies, J., Harris, S., Crichton, C., Shukla, A. and Gibbons, J. Metadata standards for semantic interoperability in electronic government. Proceedings of the 2nd international conference on theory and practice of electronic governance (2008), 67-75.
- [4] DIP project 2004. E-Government ontology 9.3. Viewed 11 November 2013 <<http://dip.semanticweb.org/documents/D9-3-improved-eGovernment.pdf>>.
- [5] Dublin Core Metadata Initiative 2013. Mission and Principles. Viewed 11 November 2013, <<http://dublincore.org/about-us/>>.
- [6] Eggebraaten, T. J., Tenner, J. W. and Dubbels, J. C. A health-care data model based on the HL7 reference information model. *IBM Systems Journal*, 46 (1) (2007), 5-18.

- [7] E-Government Unit 2006. e-Government metadata standard. Viewed 12 November 2013, <<http://www.nationalarchives.gov.uk/documents/information-management/egms-metadata-standard.pdf>>.
- [8] European Commission. European Interoperability Framework (EIF) for European public services, Annex 2. Towards interoperability for European public services, Brussels, 2010.
- [9] Fidis. (2013). D4.8 Creating the method to incorporate FIDIS research for generic application. Viewed 12 November 2013, < <http://www.fidis.net/resources/fidis-deliverables/interoperability/d48-creating-the-method-to-incorporate-fidis-research-for-generic-application/doc/1/>>.
- [10] Flak, L. S. and Solli-Saether, H. The shape of interoperability: Reviewing and characterizing a central area within e-government research. 45th Hawaii International Conference on System Sciences (2012), 2643-2652.
- [11] Gottschalk, P. Maturity levels for interoperability in digital government. *Government Information Quarterly* 26 (2009), 75-81.
- [12] Heery, R., Gardner, T. and Day, M 2000. DESIRE metadata registry framework. Viewed 12 November 2013, <<http://web.archive.org/web/20080513183558/http://www.desire.org/html/research/deliverables/D3.5/d35.html>>.
- [13] Heery, R., Johnston, P., Fulo, C. and Micsik, A. Metadata schema registries in the partially semantic web: the CORES experience, in: *Proceedings of the 2003 International Conference on Dublin Core and Metadata Applications: Supporting Communities of Discourse and Practice—Metadata Research & Applications, Dublin Core Metadata Initiative* (2003), 1–8.
- [14] International Organization for Standardization (ISO). ISO 11179. Information technology specification and standardization of data elements, 2004.
- [15] Kostur, P. Issues in information modeling. *Professional Communication Conference, 2003. IPCC 2003. Proceedings.* IEEE International.
- [16] Kubicek, H. and Cimander, R. Three dimensions of organizational interoperability: Insights from recent studies for improving interoperability frameworks. *European Journal of Practice* 6 (2009), 3-14.
- [17] Larrucea, X., Benguria, G. and Schuster, S. MDSOA for achieving interoperability. *Sixth International IEEE Conference on Commercial-off-the-Shelf (COTS)-Based Software Systems* (2007), 247.
- [18] Lee, T. Y. Information modeling from design to implementation. *National institute of standards and technology*, 1999.
- [19] Loutas, N., Peristeras, V. and Tarabanis, K. The public service ontology: a formal model for describing domain-specific semantics. *International Journal of Metadata, Semantics and Ontologies*, 6, (1) (2011), 23-34.
- [20] Medjahed, B., Rezgui, A., Bouguettaya, A. and Ouzzani, M. Infrastructure for e-government web services. *IEEE Internet Computing Magazine* 7 (1) (2003), 58–65.
- [21] Office of e-Envoy, UK 2002. E-Services development framework primer v.1.0b. Viewed 14 November 2013, <<http://users.dcc.uchile.cl/~cgutierr/e-gov/eSDFprimer.pdf>>.
- [22] Okoli, C. and Schabram, K. (2010). A guide to conducting a systematic literature review of Information systems research. Viewed 15 November 2013, <<http://ssrn.com/abstract=1954824>>.
- [23] Pankowska, M. National frameworks' survey on standardization of e-government documents and processes for interoperability. *Journal of Theoretical and Applied Electronic Commerce Research*, 3, (3) (2008), 64-82.
- [24] Peristeras, V. and Tarabanis, K. Governance Enterprise Architecture (GEA): Domain models for e-governance. *Proceedings of the 6th International Conference on Electronic Commerce* (2004), 471-479.
- [25] Peristeras, V., Tarabanis, K. and Goudos S. K. Model-driven government interoperability: A review of the state of the art. *Computer Standards & Interfaces* 31 (2009), 613-628.
- [26] Sabucedo, L. A. and Rifón, L. A. Locating and crawling egovernment services a light-weight semantic approach. *Journal of Universal Computer Science*, 16, (8) (2010), 1117-1137.
- [27] Sabucedo, L. M. A., Rifón, L. E. A., Pérez, R. M. and Gago J. M. S. Providing standard-oriented data models and interfaces to e-government services: A semantic-driven approach. *Computer Standards and Interfaces* 31 (2009), 1014-1027.
- [28] Savvas, I. and Bassiliades, N. A process-oriented ontology-based knowledge management system for facilitating operational procedures in public administration. *Expert Systems with Applications* 36 (2009), 4467-4478.
- [29] Scholl, H. J. and Klischewski, R. E-government integration and interoperability: Framing the research agenda. *International Journal of Public Administration*, 30(8) (2007), 889–920.
- [30] Scholl, H. J., Kubicek, H., Cimander, R. and Klischewski, R. Process integration, information sharing, and system interoperation in government: A comparative case analysis. *Government Information Quarterly* 29 (2012), 313-323.
- [31] Shukair, G., Loutas, N., Peristeras, V. and Sklarß, S. Towards semantically interoperable metadata repositories: The asset description metadata schema. *Computers in Industry* 64 (2013), 10–18.

- [32] The Federal Enterprise Architecture Program Management Office 2007. FEA consolidated reference model 2.3. Viewed 15 November 2013, < http://www.whitehouse.gov/sites/default/files/omb/assets/fea_docs/FEA_CRM_v23_Final_Oct_2007_Revised.pdf.
- [33] W3C 2013. Web Ontology Language. Viewed 12 November 2013, <<http://www.w3.org/2004/OWL/>>.

The Effects of Individual Differences on Trust in e-Government Services: An Empirical Evaluation

Abdulaziz ALBESHER¹ and Laurence BROOKS

School of Information Systems, Computing and Mathematics, Brunel University, Uxbridge, Middlesex, UB8 3PH, UK

Abstract. Citizen-government interaction has been innovatively improved through the use of e-Government services. Such e-services provide governmental agencies with the opportunity to enhance their reputation and increase citizens' engagement with them. However, accomplishing this transformation will not be achieved without removing any impediments that affect citizens' trust in the provided e-services. This paper aims to understand the way social individual differences (age, gender, education level, and Internet experience) affect citizens' trust in e-Government services in developing countries. A survey, looking at people's perception of trust in e-Government, of citizens drawn from different geographical areas in Saudi Arabia, was conducted. The findings of this research indicate that out of the four factors investigated, only education level has a significant impact on citizen's trust in e-government services. Therefore, it appears that as educational level increases, so does citizen's trust in e-government and so they are more likely to engage with these e-government services.

Keywords. Trust, Saudi Arabia, individual differences, e-Government

Introduction

The contemporary evolution of public services has become a salient phenomenon globally, and can be clearly seen in most governments huge invest in providing modern online public services (e-services) [17]. The success of these will not be accomplished until the barriers of citizens' trust, use, and adoption are demolished. Citizens' trust can be considered as an essential requirement to understand and enhance citizens' use and adoption of e-government services. Belanger and Carter [10] showed that e-government services will not be adopted unless citizens deem them trustworthy. The main reason behind the recognizable governmental effort is to increase citizens' trust in their e-services and thus enhance citizens' adoption of these e-services.

Over the last few years, various studies have shifted their attention to focus on understanding and examining the relationship between citizens' trust, confidence, use, and adoption of e-government services [3,7,9,16,22,30,39,45,46]. Most of these studies see e-government as a transformational technology that innovatively facilitates and enhances citizens' interaction with government, and empowering citizens' trust and satisfaction in government to avoid any long term decline.

¹ Corresponding Author.

From a recent review of e-government literature, this paper found that there is a significant gap in the literature for understanding the relationship between citizens' trust and e-government; especially understanding the effects of demographics differences on trust in e-government [30]. In addition, a noticeable lack of either statistical or empirical evidence was found in the e-government literature [10,30,34].

Previous studies of technology adoption have found age, gender, education level, and Internet experience as constant significant predictors either directly or indirectly in information systems research [7,24,28,31,32,39,45]. Therefore, this paper reports on an empirical study which investigates and looks to understand the effects of demographic differences on citizen's trust in e-government services.

1. Individual Differences

1.1. Age

Several IS research have broadly studied the impact of age differences [7,31,39,45]. Age differences is considered as a vital barrier that significantly contributes directly or indirectly to users' adoption of a new system or one of the e-Government services [4], [31,45]. Previous research has shown that older people, in general, are more likely to avoid unfamiliar tasks resist change in both social interactions and working environments [33,38]. Avgerou and Walsham [6] found that in developing countries younger people prefer to interact and use ICT more than older people.

In ICT studies, it has been argued that older people do not prefer computer interaction in general, thus it results in limited training and computer knowledge [25]. Moreover, Van Dijk and Hacker [42] argued that lack of interaction with computers forms a type of computer fear, especially in rural areas; they also found that older people are more likely to be affected by this computer fear. Correspondingly, Gilbert et. al. [22] used age differences to assess the mechanism for e-Government and found that younger people are more likely to adopt e-Government services than older people. Al-Ghaith et. al. [1], in a similar study in Saudi Arabia, found that the youngest group (15–25 years old) was the most likely group to adopt e-Government services. This research suggests that age is an important predictor for understanding trust in e-Government services at the individual level (citizens). Therefore, hypothesis H1 is proposed:

H1: Age group differences will significantly impact citizen's trust in e-Government services.

1.2. Gender

Previous studies have revealed that gender has an extensive effect on use and technology adoption [21,44,45]. Male users tended to be more likely to use and adopt ICTs than female users [31]. Gefen et. al., [21] showed that female users are often slower than male users in learning to use technology, which indicates that even the perceptions of technology differentiate based on gender differences. Moreover, in developing countries [6] it appears that male users tend to use ICTs more frequently than female users.

A number of studies have investigated the impact of gender differences in adoption and attitudes towards e-Government services [3,9,15,16,39,43]. For example, a study by Choudrie and Papazafeiropoulou [15] the UK found that male users were more willing than female users to use e-Government services.

From earlier studies, gender has been identified as an effective predictor of public e-services use. However, it is been suggested that although male and female attitudes differ towards technology, the increased number of females online users eliminate this argument [7,32]. Therefore, to explore the role of gender differences in trust in e-Government services, this paper will investigate the following hypothesis:

H2: Gender differences will NOT significantly impact citizens' trust in e-Government services.

1.3. Education Level

Various IS scholars state education level as the most important driver. It has been emphasized that education level is consistently seen as one of the major challenges affect individual's attitude towards technology [3,7,39,45]. Previous research suggests a strong relation between education level and usage, such that people with higher levels of education are more likely to use computers than people with lower education levels [12,31,42]. Similarly the adoption of new innovations has been found higher in people with higher educational levels [13,18,36]. Moreover, in the context of e-Government, education level has been demonstrated as a powerful predictor, such that the higher the education level the more positive the attitude and adoption rates [3,9,16,39,45]. Accordingly, education level appears as a vital predictor for the use and adoption of different technologies and particularly for e-Government services. Therefore, this study aims to understand the effect an individual's education level has on trust in e-Government services. As a consequence, the proposition is:

H3: Education level differences will significantly impact citizens' trust in e-Government services.

1.4. Internet Experience (Antecedent Experience)

During the development of information systems, antecedent Internet experience has been suggested as being a significant predictor of the acceptance and adoption of new e-services [26,27,37].

Karjaluoto et. al., and Trocchia and Janda [27,40] assumed that the Internet experience factor may divide users, as people with higher Internet experience may be more willing to trust and adopt e-services than people with lower Internet experience. Some may argue that positive Internet experiences with e-Government services or even with Internet merchants may increase individual trust in new e-Governmental services. However, negative perception or experience with e-Government services may decrease trust in their services and consequently affect adoption of any new e-Governmental services [29].

Van Dijk [41] mentioned that unpleasant initial experience might discourage individual's trust and use of computers, and the same concept can be used in the case of trusting a new e-Governmental services. The nature of e-Government services requires a boost of trust to increase citizen's adoption of these services [5]. Therefore, Internet experience may play a critical role in empowering citizens' trust in e-Government services. With this in mind, the following is proposed:

H4: Internet experience differences will significantly impact citizens' trust in e-Government services.

2. Research Methodology

A quantitative survey approach was adopted for this study, since the empirical research required information on large numbers of the population [18–20]. The survey was conducted among different citizens in Saudi Arabia. This technique was selected because of the acknowledgment in similar research that it is the most appropriate and realistic technique in such cases [3,7].

A pilot test was conducted with 40 participants, randomly selected, to avoid unclear wording in the instrument and revisions made accordingly. Although, the content of the questionnaire validated by the majority of the respondents, minor changes took a place on the final questionnaire design based upon the received feedback. Once the survey was refined, it was distributed randomly in July 2013 for two months, among Saudi Arabian citizens in a number of cities. Various methods were used to disseminate the questionnaire (such as by hand in public places, social networks, emails). The random sampling approach was adopted in order to collect unbiased data from the targeted population. Of the 731 returned survey questionnaires 531 were completed and used in the analysis.

3. Data Analysis

Analysis of the survey data was carried out using the statistical software package SPSS 20. The variables included in this study were nominal variables, accordingly the chi-squares test (χ^2) was performed to determine statistical significance of the demographic differences of the citizens' trust on e-government services as well as looking at distrust [11,35]. The TOE construct (Trust on e-Government) consists of five scale items, which were taken from previously validated instruments [10,14]. The scale's reliability is 0.888 which implies a high internal consistency [23], and when factor loadings are performed, using a confirmatory factor analysis, all items loaded together properly on the construct.

3.1. Respondents' Profile

The respondents' profile has been divided into four sections based on age, gender, education level, and Internet experience. The majority of the respondents (40.3%) ranged from 30 to 44 years. Most of the respondents were male, about 72% of the sample. 58% of the sample reported that they hold a bachelor degree. Furthermore, about 60% of the respondents reported that they have over 4 years Internet experience. Table 1 summarizes the demographics information.

4. Results

H1: Age group differences will significantly impact citizen's trust in e-Government services.

Table 2 show that the majority of the respondent were neutral towards trusting in e-Government services, with the highest percentage (53.8%) for age group +55 years, followed by 41.5% for age group 45–54 years, then 36.9% and 35.8% for age groups

Table 1. Respondents' profile

Demographic	Category	Frequency	%
Age	<18 years	12	2.3
	18–24 years	119	22.4
	25–29 years	120	22.6
	30–44 years	214	40.3
	45–54 years	53	10.0
	+55 years	13	2.4
Gender	Male	391	71.8
	Female	160	28.2
Education	Less than high school	7	1.3
	High school	58	10.9
	Diploma	31	5.8
	Bachelor	308	58.0
	Postgraduate	127	23.9
Internet Experience	1–6 months	2	0.4
	7–11 months	34	4.5
	1–2 years	61	9.6
	3–4 years	144	25.3
	+4 years	329	60.2

Table 2. Crosstabulation analysis between Age and Trust in e-Government services

		Age * TOE Crosstabulation					
		Strongly distrust	Distrust	Neutral	Trust	Strongly trust	Total
Age	<18 years	0	5	5	2	0	12
		0%	41.6%	41.6%	16.6%	0%	100%
	18–24 years	7	23	44	32	13	119
		5.8%	19.3%	36.9%	26.8%	10.9%	100%
	25–29 years	5	17	43	40	15	120
		4.1%	14.1%	35.8%	33.3%	12.5%	100%
	30–44 years	14	38	61	66	35	214
		6.5%	17.7%	28.5%	30.8%	16.3%	100%
	45–54 years	4	6	22	18	3	53
		7.5%	11.3%	41.5%	33.9%	5.6%	100%
	+55 years	0	0	7	5	1	13
		0%	0%	53.8%	38.4%	7.6%	100%
Total		30	89	182	163	67	531
		5.6%	16.7%	34.2%	30.6%	12.6%	100%

18–24 years and 25–29 years, respectively. Nevertheless, most of the respondents (214) within the age group 30–44 years were found to be trusting of e-Government services. Moreover, neutral and more distrustful respondents were found about equal within the age group <18 years. The Pearson chi-square for the sample shows no significant differences between age groups and citizens' trust in e-Government services (χ^2 (320, n = 531) = 311.420, p = .624).

H2: Gender differences will NOT significantly impact citizens' trust in e-Government services.

Table 3 shows that most of the respondents (182) were neutral towards trust in e-Government services, 34.2%. It also reveals that 31.7% of male respondents were trusting in e-Government services, compared with 28% of the female respondents. Remarkably, only 5.64% of the sample were found to strongly distrust e-Government services. Overall, the Pearson chi-square for the sample shows no significant differences

Table 3. Crosstabulation analysis between Gender and Trust in e-Government services

		Gender * TOE Crosstabulation					Total
		Strongly distrust	Distrust	Neutral	Trust	Strongly trust	
Gender	Male	22 5.77%	55 14.4%	128 33.5%	121 31.7%	55 14.4%	381 100%
	Female	8 5.33%	34 22.6%	54 36%	42 28%	12 8%	150 100%
Total		30 5.64%	89 16.7%	182 34.2%	163 30.6%	67 12.6%	531 100%

Table 4. Crosstabulation analysis between Education level and Trust in e-Government services

		Education level * TOE Crosstabulation					Total
		Strongly distrust	Distrust	Neutral	Trust	Strongly trust	
Education level	Less than high school	1 14.2%	4 57.1%	1 14.2%	1 14.2%	0 0%	7 100%
	High school	8 13.7%	10 17.2%	18 31.0%	19 32.7%	3 5.17%	58 100%
	Diploma	2 6.4%	4 12.9%	7 22.5%	11 35.4%	7 22.5%	31 100%
	Bachelor	14 4.5%	57 18.5%	106 34.4%	93 30.1%	38 12.3%	308 100%
	Postgraduate	5 3.93%	14 11.0%	50 39.3%	39 30.7%	19 14.9%	127 100%
	Total	30 5.64%	89 16.7%	182 34.2%	163 30.6%	67 12.6%	531 100%

between gender and citizens' trust in e-Government services (χ^2 (64, n = 531) = 71.222, p = .250).

H3: Education level differences will significantly impact citizens' trust in e-Government services.

The Pearson chi-square result shows that there was significant differences between education level and citizens' trust in e-Government services (χ^2 (256, n = 531) = 431.870, p = .000). Table 4 show that most of the respondents (308) hold a bachelors' degree and 34.4% of them were neutral towards trusting e-government services followed by 30.1% who said they are more trusting of e-Government services. 35.4% and 32.7% of respondents holding a diploma and high school certificates respectively, reported as trusting of e-Government services. In contrast, a minority of respondents that hold a lower qualification (ie. less than high school (4)) were found more distrusting of e-Government services.

H4: Internet experience differences will significantly impact citizens' trust in e-Government services.

The majority of the sample (320) have more than 4 years Internet experience and were neutral (33.7%) towards trust in e-Government services (Table 5). The results also show that 37.5% of the respondents with 7–11 months Internet experience were more trusting of e-Government services. The Pearson chi-square test shows that there was no significant differences between Internet experience and citizens' trust in e-Government services (χ^2 (256, n = 531) = 258.078, p = .452). Table 6 summarizes the results of the hypotheses testing.

Table 5. Crosstabulation analysis between Internet experience and Trust in e-Government services

		Internet Experience * TOE Crosstabulation					Total
		Strongly distrust	Distrust	Neutral	Trust	Strongly trust	
Internet Experience	1–6 months	0	0	1	1	0	2
		0%	0%	50%	50%	0%	100%
	7–11 months	1	4	8	9	2	24
		4.16%	16.6%	33.3%	37.5%	8.33%	100%
	1–2 years	2	14	21	11	3	51
		3.92%	27.4%	41.1%	21.5%	5.88%	100%
	3–4 years	6	27	44	38	19	134
		4.47%	20.1%	32.8%	28.3%	14.1%	100%
	+4 years	21	44	108	104	43	320
		6.56%	13.7%	33.7%	32.5%	13.4%	100%
Total	30	89	182	163	67	531	
	5.64%	16.7%	34.2%	30.6%	12.6%	100%	

Table 6. Summarised hypothesis testing using chi-square (χ^2)

Hypothesis	Statistics/degree of freedom	P-value	Supported
Age [H1]	311.420 (320 df)	.624	NO
Gender [H2]	71.222 (64 df)	.250	YES
Education level [H3]	431.870 (256 df)	.000	YES
Internet experience [H4]	258.078 (256 df)	.452	NO

5. Discussion

This research explored the effects of demographics differences on citizens’ trust in e-Government services. These demographic variables were derived from previous research presented in the e-Government and ICT literature as major predictors in the adoption, trust, and use of e-Government [2,7,39,45]. Analysis of the survey data shows that differences among age groups do not significantly predict citizen’s trust in e-Government services. This result supports the findings of Venkatesh et. al. [45] about e-Government portal use, and contradicts the findings of Al-Shafi and Veerakkody [3] who tested the effect of age differences on the adoption of e-Government in Qatar. Corresponding to prior studies [7,18] on gender, the proposed hypothesis has been supported and this study found no significant differences between gender and citizens’ trust in e-Government services. In contrast, Venkatesh et. al. [45] found gender as a predictor for e-Government portal use. In terms of education level the findings here show that there was a disparity in citizens’ trust in e-Government services based on their education level and this emphasizes previous findings [3,7,45], which indicate the importance of education level in trust, use, and adoption of new e-Government services. Furthermore, Table 4 shows that trust in e-Government services increased within citizens with higher education levels. This could be overcome by increasing the effort to access citizens with lower education [32]. In previous research [5], Internet experience was found to have an effect on e-Government adoption, however this study did not find

a significant interaction between Internet experience and citizen's trust in e-Government services. This could be as a result of a set of completely different experiences (like e-shopping) than transacting with the government. This requires further investigation.

6. Conclusion

This paper explored the effect of citizens' trust in e-Government services in Saudi Arabia, given that a number of e-Government studies have shifted their focus towards developing countries in order to understand the differences that arise from context [8,45]. The idea that citizens who trust in e-Government services are more likely to use and adopt e-government services as the preferred interaction method, were emphasized by the e-Government literature. Empirically, the sample used in this study was gathered from different geographical areas of Saudi Arabia. Two of the proposed hypotheses were shown to have a statistical effect on citizen's trust in new e-Government services. This sort of finding provides a great opportunity for government agencies to realize the importance of the demographic differences and to try to diminish any social individual barriers. In addition, it provides good insight into the demographic groups, especially those requiring more of a focus on their beliefs about e-Government services. Consequently it will allow different groups in the population to maximize their benefits and commitments toward these new e-Government services. Moreover, from a different perspective, e-Government could contribute to the individual differences since it represents an innovative technology that certain members of society are excluded from. Therefore, we encourage future research to examine the role of more demographic and digital divisions related to trust in e-Government services.

References

- [1] Al-Ghaith, W.A., Sanzogni, L., & Sandhu, K.: Factors Influencing the Adoption and Usage of Online Services in Saudi Arabia. *The Electronic Journal of Information Systems in Developing Countries*, 40 (2010).
- [2] Alkhunaizan, A., & Love, S.: Effect of Demography on Mobile Commerce Frequency of Actual Use in Saudi Arabia. In: *Anonymous Advances in Information Systems and Technologies*, pp. 125–131. Springer (2013).
- [3] Al-Shafi, S., & Weerakkody, V.: Factors Affecting e-Government Adoption in the State of Qatar. (2010).
- [4] Al-Sobhi, F.: The Roles of Intermediaries in the Adoption of e-Government Services in Saudi Arabia. School of Information Systems, Computing and Mathematics, (2011).
- [5] Al-Sobhi, F.: The Roles of Intermediaries in the Adoption of e-Government Services in Saudi Arabia. School of Information Systems, Computing and Mathematics, (2011).
- [6] Avgerou, C., & Walsham, G.: *Information technology in context: Studies from the perspective of developing countries*. Ashgate Publishing Company (2001).
- [7] Bélanger, F., & Carter, L.: The Effects of the Digital Divide on E-Government: An Empirical Evaluation. 4 (2006) 81c–81c.
- [8] Bélanger, F., & Carter, L.: Digitizing Government Interactions with Constituents: An Historical Review of E-Government Research in Information Systems. *Journal of the Association for Information Systems*, 13 (2012).
- [9] Bélanger, F., & Carter, L.: The Impact of the Digital Divide on e-Government use. *Commun ACM*, 52 (2009) 132–135.

- [10] Bélanger, F., & Carter, L.: Trust and Risk in e-Government Adoption. *The Journal of Strategic Information Systems*, 17 (2008) 165–176.
- [11] Brace, N., Kemp, R., & Snelgar, R.: SPSS for psychologists: A guide to data analysis using SPSS for windows, versions 12 and 13. L. Erlbaum Associates Inc. (2006).
- [12] Brown, S.A., & Venkatesh, V.: Model of Adoption of Technology in Households: A Baseline Model Test and Extension Incorporating Household Life Cycle. *MIS quarterly*, (2005) 399–426.
- [13] Burgess, R.G.: *Key variables in social investigation*. Routledge & Kegan Paul (1986).
- [14] Carter, L., & Bélanger, F.: The Utilization of e-government Services: Citizen Trust, Innovation and Acceptance Factors*. *Information Systems Journal*, 15 (2005) 5–25.
- [15] Choudrie, J., & Papazafeiropoulou, A.: Lessons Learnt from the Broadband Diffusion in South Korea and the UK: Implications for Future Government Intervention in Technology Diffusion. *Electronic Government, an International Journal*, 3 (2006) 373–385.
- [16] Colesca, S., & Dobrica, L.: Adoption and use of e-Government Services: The Case of Romania. *Journal of Applied Research and Technology*, 6 (2008).
- [17] Colesca, S., & Dobrica, L.: Adoption and use of e-Government Services: The Case of Romania. *Journal of Applied Research and Technology*, 6 (2008).
- [18] Dwivedi, Y.K., & Lal, B.: Socio-Economic Determinants of Broadband Adoption. *Industrial Management & Data Systems*, 107 (2007) 654–671.
- [19] Dwivedi, Y.K., Choudrie, J., & Brinkman, W.: Development of a Survey Instrument to Examine Consumer Adoption of Broadband. *Industrial Management & Data Systems*, 106 (2006) 700–718.
- [20] Flavián, C., & Guinalíu, M.: Consumer Trust, Perceived Security and Privacy Policy: Three Basic Elements of Loyalty to a Web Site. *Industrial Management & Data Systems*, 106 (2006) 601–620.
- [21] Gefen, D., & Straub, D.W.: Gender Differences in the Perception and use of E-Mail: An Extension to the Technology Acceptance Model. *MIS quarterly*, 21 (1997).
- [22] Gilbert, D., Balestrini, P., & Littleboy, D.: Barriers and Benefits in the Adoption of e-Government. *International Journal of Public Sector Management*, 17 (2004) 286–301.
- [23] Hinton, P., Brownlow, C., & McMurray, I.: SPSS explained. Routledge (2004).
- [24] Hoffman, D.L., Novak, T.P., & Schlosser, A.: The Evolution of the Digital Divide: How Gaps in Internet Access may Impact Electronic Commerce. *Journal of Computer-Mediated Communication*, 5 (2000).
- [25] Igbaria, M., & Parasuraman, S.: A Path Analytic Study of Individual Characteristics, Computer Anxiety and Attitudes Toward Microcomputers. *Journal of Management*, 15 (1989) 373–388.
- [26] Jaruwachirathanakul, B., & Fink, D.: Internet Banking Adoption Strategies for a Developing Country: The Case of Thailand. *Internet Research*, 15 (2005) 295–311.
- [27] Karjaluoto, H., Mattila, M., & Pento, T.: Factors Underlying Attitude Formation Towards Online Banking in Finland. *International Journal of Bank Marketing*, 20 (2002) 261–272.
- [28] Kelley, C.L., & Charness, N.: Issues in Training Older Adults to use Computers. *Behaviour & Information Technology*, 14 (1995) 107–120.
- [29] Lee, J., Kim, H.J., & Ahn, M.J.: The Willingness of e-Government Service Adoption by Business Users: The Role of Offline Service Quality and Trust in Technology. *Government Information Quarterly*, 28 (2011) 222–230.
- [30] Morgeson, F.V., VanAmburg, D., & Mithas, S.: Misplaced Trust? Exploring the Structure of the e-Government-Citizen Trust Relationship. *Journal of Public Administration Research and Theory*, 21 (2011) 257–283.
- [31] Morris, M.G., & Venkatesh, V.: Age Differences in Technology Adoption Decisions: Implications for a Changing Work Force. *Person. Psychol.*, 53 (2000) 375–403.
- [32] Mossberger, K., Tolbert, C.J., & Stansbury, M.: *Virtual inequality: Beyond the digital divide*. Georgetown University Press (2003).
- [33] Myers, C., & Conner, M.: Age Differences in Skill Acquisition and Transfer in an Implicit Learning Paradigm. *Applied Cognitive Psychology*, 6 (1992) 429–442.
- [34] Norris, D.F., & Lloyd, B.A.: The Scholarly Literature on e-Government: Characterizing a Nascent Field. *International Journal of Electronic Government Research (IJEGR)*, 2 (2006) 40–56.
- [35] Pallant, J.: *SPSS survival manual: A step by step guide to data analysis using SPSS*. McGraw-Hill International (2010).
- [36] Rogers Everett, M.: *Diffusion of Innovations*. New York, (1995).
- [37] Schumacher, P., & Morahan-Martin, J.: Gender, Internet and Computer Attitudes and Experiences. *Comput. Hum. Behav.*, 17 (2001) 95–110.
- [38] Sharit, J., & Czaja, S.J.: Ageing, Computer-Based Task Performance, and Stress: Issues and Challenges. *Ergonomics*, 37 (1994) 559–577.
- [39] Taipale, S.: The use of e-Government Services and the Internet: The Role of Socio-Demographic, Economic and Geographical Predictors. *Telecommun. Policy*, 37 (2013) 413–422.

- [40] Trocchia, P.J., & Janda, S.: A Phenomenological Investigation of Internet Usage among Older Individuals. *Journal of consumer marketing*, 17 (2000) 605–616.
- [41] Van Dijk, J.: The One-Dimensional Network Society of Manuel Castells. *New media & society*, 1 (1999) 127–138.
- [42] Van Dijk, J., & Hacker, K.: The Digital Divide as a Complex and Dynamic Phenomenon. *The information society*, 19 (2003) 315–326.
- [43] Van Dijk, J., Pieterse, W., van Deuren, A. et. al.: E-services for citizens: the Dutch usage case. In: *Anonymous Electronic government*, pp. 155–166. Springer (2007).
- [44] Venkatesh, V., Morris, M.G., Davis, G.B. et. al.: User Acceptance of Information Technology: Toward a Unified View. *MIS quarterly*, 27 (2003).
- [45] Venkatesh, V., Sykes, T.A., & Venkatraman, S.: Understanding e-Government Portal use in Rural India: Role of Demographic and Personality Characteristics. *Information Systems Journal*, (2013).
- [46] Welch, E.W., Hinnant, C.C., & Moon, M.J.: Linking Citizen Satisfaction with e-Government and Trust in Government. *Journal of Public Administration Research and Theory*, 15 (2005) 371–391.

How Can ICTs Support Rural Development

Arild JANSEN¹

University of Oslo, Norway

Abstract. The development of Internet and small scale computing created the belief that ICTs would help the development of rural areas. In retrospect, these visions turned out to be too optimistic. Today, we experience rather dramatic centralisation trends. This is not because of ICTs alone, but we have seen that ICTs often support centralizing forces, rather than help local development. However, the academic discourse on these issues suffers from the lack of clarity and precise understanding of the ICT artefact. We have therefor developed an analytical framework by conceptualizing ICTs along three dimensions; how it is viewed, its use and how it impacts development. Our main message is that ICTs have to be used locally to foster horizontal collaboration, innovation and knowledge creation activities.

Keywords. Conceptualizations of ICTs artefact, rural development, ICT impact

Introduction

The visions for the implications of ICTs diffusion in society have been from the beginning of the computer area overall optimistic, if not prophetic. The computerized future of these predictions was marked by democratization and decentralization: computing power in the hands of everyone, “telecommuting” and work at home. Writers like Toffler (1980), Naisbitt (1982) expressed similar predictions, leading to the hope that ICT development could support local development.

Based on such visions, ICTs were seen as important means for strengthening regional development and help local communities. Various projects were initiated to stimulate economic growth at regional and local levels. However, most of these projects did not succeed in creating sustainable local enterprises. Since then, we have experienced massive diffusion and adoption of ICTs in all part of the economy. But at the same time, we have seen strong centralisation trends, both at macro level and in the different business sectors. There is thus a need to explore the role that ICTs may have in rural development and to offer a framework that can help such analysis.

Research Methodology

This study departs from two scientific discourses in the past; i) ICT and decentralisation and ii) ICT for rural development. The theoretical part is based on a limited literature review and document studies, including some recent literature on ICT for development, which then constitutes the basis when developing our analytical framework. This framework is applied in analysing the role of ICTs in rural policies. The empirical part is collected by analysing policy documents.

¹ Corresponding Author: Section for eGovernment, University of Oslo, Norway, arildj@jus.uio.no.

1. Theoretical Perspectives

1.1. Revisiting the ICT, Centralisation and Decentralisation Debate

Of all issues raised in the debates of ICT and its impact on society, few have been more contested than those of computers and (de)centralisation. George and King, in their seminal paper from 1991, addressed the general question of computerization's effect on organizational decision authority structures – the factor generally regarded among organizational sociologists as the underlying issue in organizational centralization. The question was whether computerization would result in a greater concentration of decision authority at the top of the organization (centralization), or disperse decision authority down and outward in the organization (decentralization). Below, we will briefly review some of the arguments.

The first position, that computerization causes centralization or decentralization, originated by Leavitt and Whistler (1958), in predicting that the introduction of computerized IS would lead to the centralization of organizational decision authorities. Other studies supported this claim. They were shortly opposed by other researchers, e.g. Burlingame (1961) arguing that IS use was more likely to lead to decentralization of decision authority.

Both of these positions can be seen as a variant of a more basic assumption: that computerization causes changes in organizational decision authority structures. This view, which has been called the *technological imperative*, “... views technology as an exogenous force which determines or strongly constrains the behaviour of individuals and organizations” (Whistler, 1970 p. 585). But causal statements like the technological imperative imply a reliable pattern of cause and effect, so the unresolved question of which effect occurs plagues any articulation of the technological imperative. Thus, both logical arguments and empirical evidence that supported two contradictory positions, made it easy to argue that there was no inherent causal relationship between computerization and decision authority structure: there is no such imperative.

The “no-inherent-relationship” position was not the only way to account for the contradictory evidence. Instead of assuming that computerization caused particular decision authority structures to emerge, it made more sense to some researchers to assume that computerization activities would *reflect* the prevailing centralized or decentralized persuasions of the organizations in which they occurred. This view became formalized as the reinforcement politics argument, in which computing is viewed as a malleable technology controlled by the dominant coalition in an organization and used by that group to serve the interests of the status quo (George and King, 1991). Such view has been called the *organizational imperative* which “... assumes almost unlimited choice over technological options and almost unlimited control over consequences [...] information technology is the dependent variable in the organizational imperative, caused by the organization's information processing needs and manager's choices about how to satisfy them” (Markus and Robey, 1988 p. 587).

These perspectives, with its primary focus on the use of ICT in organization, are no less relevant when analyzing the role of ICTs for rural development at a macro level. However, in much of this research, ICTs is primarily regarded as simple artefacts, more or less seen as black boxes. That may be one explanation why there are so many apparently contradicting findings as we have seen above. Furthermore, our experiences during the last 25 years, not least due to the availability of Internet, are that ICTs very well can support all types of organizational structures. At the same time, these ICTs have been

decisive factors for a large number of innovations, both at micro and macro level supporting a “no-inherent-relationship” position.

2. ICT Seen as Instrument for Regional Development

The development of telecommunications and democratisation of computing through the development and small scale computers paved the road for technological optimism during the 1980s. Toffler (1980) hold that industrial-style, centralized; top-down planning would be replaced by a more open, democratic, decentralized style which he called “*anticipatory democracy*”. Nora and Minc (1981) predicted that “*a massive social computerization will take place in the future, flowing through society like electricity providing access to computer power for everyone regardless of space and time.*” In a post-industrial society, people could live and work everywhere, regardless of space and time, and still be connected to a global economy.

These arguments possessed a sort of technological imperative, viewing ICTs as exogenous forces that would lead persons or organisations to act in ways that could help rural economies. However, others refused these rather optimistic visions, claiming that the implications for rural development are open: Hepworth (1989) provided a at that time good survey of the research field, and concluded that the use of ICTs could lead to i) increased vulnerability for changes outside the sphere of influence for the local community, ii) increased centralisation, and division of knowledge in the population, and iii) reduced local democracy and autonomy.

Gillespie and Goddard (1990) argued similarly that adequate telecommunications are a necessary, but far from sufficient mechanism for regional development. They go further in saying that “improved communication and better trade relation with fewer barriers provide a better competitive climate for stronger rather than weaker economies”. These arguments may be closer to an organisational imperative, or may be power reinforcement’s arguments. A number of later studies provide arguments along the same lines (e.g. Rogers, 1995; Qvortrup, 1997; OECD, 1997). Jansen (1998) concluded, in his study of ICT diffusion in rural areas, that ICT networks may very well support centralisation of information handling through vertical integration of local businesses into national and international corporations. He identified alternative trajectories, characterised by building horizontal networks allowing for development of local knowledge and competence that are necessary for maintaining, even extending local industries.

2.1. *The “End of Geography” Version of the “New Economy”*

Without a doubt, the strongest thesis that has been advanced with respect to the impact of the “new economy” on the balance between centripetal and centrifugal forces is that the latter will come to predominate, once the major reason for agglomerated spatial forms is rendered obsolete through distance-shrinking technologies. In the 1990s, the advent of the Internet excited commentators to speculate upon spatial outcomes, with, inter alia, Negroponte (1995), stating that “*the post-information age will remove the limitations of geography*”. Others asserted that “cities are leftover baggage from the industrial era”, and the “death of distance. More recently, scholars as e.g. Gillespie, Richardson and Cornford (2001) arrive at different conclusions in claiming that there are, however, a number of inter-related reasons that help to explain why ICT appear not to inevitably undermine existing urban agglomerations. These include the metropolitan

bias in telecommunications infrastructure provision; the role of ICT in contributing to the strengthening of “global cities”; and the persistence, despite electronic networks, of what has been termed “the compulsion of proximity”. Gillespie et al (2001) suggest that ICT-based innovations in the organisation and delivery of service activities could have potentially radical implications for the locational dynamics of services. These innovations, notably the tele-mediation of service delivery through telephone call centres and the Internet – are making possible the “industrialisation” of services production and, at the same time, are making many routine services locational “footloose”. However, such use of ICT implies while the jobs are located locally, the strategic control reside in the corporate headquarters, strongly supporting a centralistic power structure.

2.2. *ICT in the Developing Countries*

The literature on ICT for Development field (short ICT4D), which discusses the diffusion and adoption of ICT in developing countries, resemble must of the former debate on ICT and rural development in general. According to Rickard Heeks (2008) “*The Internet sparked a generalized upsurge of interest in ICTs, including a reinvigorated interest in how ICT might be applied in developing world. Similar to the model that had been rolled out in the European and North American periphery during the 1980s, was the rural “telecottage” or “telecenter”. This model could be installed fairly quickly; provide tangible evidence of achievement; deliver information, communication, and services to poor communities; and no least provide sales for the ICT companies in wealthy countries*”. The next step for ICT4D was to look at service delivery for the poor. Today, a priority for ICT4D “2.0” will be conceiving new applications and new business models that can use the growing ICT base of mobiles, telecenters etc., to create employment. However, the technical, organizational and competence infrastructure is itself major factors for creating large gaps between centre and periphery (Heeks, 2008). Thus, the ICTs both resemble and extend the divides that existed when this was mainly a digital divide challenge in the western world.

2.3. *A Need for More Precise Concepts*

A major problem with this discourse is the lack of precision. E.g. decentralisation is fuzzy concept. Firstly, it can mean administrative decentralisation, meaning that operations within an organisation are transferred to a lower level in an organisation, while the decision making power is kept centrally. Secondly, one can emphasise the political dimension of decentralisation, which implies that the authority to define goals is moved from higher to lower levels of authority. Thirdly, it may mean deconcentration of resources, such as businesses and departments, from centres to the periphery.

It is obvious that ICTs can easily support all types of organisational patterns. Thus it is a strong need to open the “black box” and to be more specific about what type technology that is in question. Sein and Harindranath (2003) suggest three different set of conceptualizations of ICT: how it are viewed, its use and how it impacts development. Their ICT *use* categories are: “as a commodity, as support for general development activities, as an economic driver and for specific development”, while their ICT *impact* is conceptualized into first, secondary and tertiary effects.

Their ICT *views* are broadly based on the classification proposed by Orlikowski and Iacono (2001); the tool, computational, ensemble and proxy views, but not the

nominal view. However, we do not necessarily subscribe to all Orlikowski and Iacono’s specific view categories, which have been extracted from how researchers have conceptualised ICT in their own research. While we find that the tool, ensemble and partly the computational views as fruitful, the nominal and proxy views provide little insight into the multidimensional character of ICTs. Rather, we build on an analysis of actual functions that ICTs have in organisations Jansen (2012). Our “view” categories are thus: *tool, information infrastructure, service and expertise*.

Our “*tool*” view is similar to that of Orlikowski and Iacono in understanding ICT as an engineering artefact as value-neutral artefacts, expected to do what its designers intended them to do. A tool is a substitute for labour; it has no value beyond its capability to support the necessary production or administrative processes. Our second view, as *information infrastructure*, is to be understood as the basic technical and organization capabilities, including information resources that are necessary for supporting various application systems and solutions across organisations and society at large, partly corresponding to an Orlikowski and Iacono’s ensemble view. Further, our *service* view implies to see ICTs as more autonomous, being able to carry out independent task or functions, borrowing from both the computational and ensemble views, in that it may include organisational and social aspects. Finally, our *expertise* view assumes that ICTs can support various knowledge creation activities, e.g. to collect, process and mediate information and knowledge. “Big data” is one illustration of this view. In that respect, it comprises a number of aspects that are included in the proxy view. We will, however emphasize that our four views are not exhaustive in that they embrace all possible view ICTs, being generic and enabling.

Our framework builds on Sein and Harindranath (2003); we include both the view, use and the impacts dimensions. However, as our perspective is somewhat different: to analyse the role of ICT for development in marginal areas inside countries, we also need to modify their other dimensions. Our “use” conceptualizations, being *production, management and control, innovation and knowledge creation activities*; do only partly correspond to Sein and Harindranath’ suggestions. Production implies operational activities, both related to physical and administrative activities, including their commodity use, while management and control may belong to development activities, and innovation and knowledge creation can be seen as an economic driver. Along the “*impact*” dimensions, our three categories *efficiency, effectiveness and transformation* roughly correspond to their first, secondary and tertiary impacts, but provide more specific meanings.

Our framework is illustrated in Fig. 1.

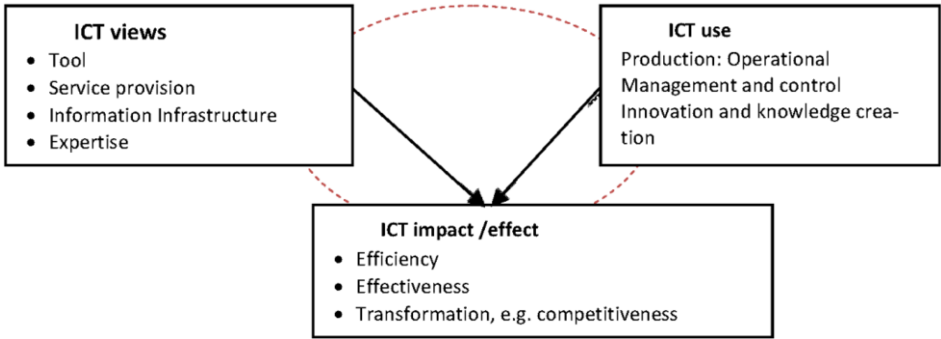


Figure 1. Framework for analysing ICT-policies in rural areas.

Table 1. The expected relationship between conceptualization of ICT view, ICT use and ICT impact

ICT View	ICT USE		
	Production	Management and control	Innovation & knowledge creation activities
Tool	Efficiency	Efficiency	Less relevant
Infrastructure	Efficiency and effectiveness	Efficiency, some effectiveness	Support innovation
Service	Efficiency and effectiveness	Efficiency and effectiveness	Help transformation
Expertise	Effectiveness	Effectiveness	Transformation

In their analysis, Sein and Harindranath (2004) claim that that a national ICT policy must address the need to make move from the lower to the higher rated categories, which in our terminology imply to shift focus from production and management to innovation and knowledge activities, which then aim at increasing the impact from efficiency to effectiveness and transformation. The proposed relationships between these conceptualizations are illustrated in Table 1.

Departing from a tool view, ICTs is seen as substitute for previous manual activities, thus the impact on production is mainly to increase speed or capacity, which implies improved efficiency. Similar effects will be found in management and control actions, while the tool perspective is less relevant in innovation activities. An information infrastructure view can support both efficiency and effectiveness effects in that large ensembles of ICT-based resources and information in particular are made generally available, which also can help transformation. The service view can also increase effectiveness both in operation and in management, and help more innovative activities; in that ICT-based services can support cooperation and knowledge sharing in various ways. Lastly, an expertise view clearly supports both effectiveness and transformation.

This framework has thus to be validated through further empirical testing.

3. Discussing the Framework

3.1. *The Role of ICTs in Past Rural Policies*

The previous optimistic visions lead to a rather strong belief that ICT would help to resist the negative trends in regional development that had been observed for a number of years, both in many European countries and elsewhere. In Scandinavia, it was much focus on maintaining vital rural areas, and a number of initiatives were launched, e.g. building telematics infrastructure, to support local ICT-based centres and distant teaching, telemedicine etc.

Evaluations of these programs (Qvortrup, 1997; Jansen, 1998) showed that the effects of the program were limited, not least in a long term perspective. The strategic orientation of the efforts was in general weak, in that competence development and capabilities to accomplish organisational changes had been lacking. The impact on the local economies was very limited. The main exception was the telemedicine projects, which stimulated collaboration and competence building between the involved parties and in this way caused organisational changes (Jansen, 1995).

These efforts did not counteract the general trajectory of change in the economy, dominated by vertical integration into centrally controlled organisations. We have wit-

nessed rather a massive diffusion and adoption of ICTs in all parts the economy; new technologies have been implemented successfully in most branches of local economies, in spite of often weak local infrastructures and support functions. However, various studies also showed that a large majority of local enterprises became strongly integrated into national networks and organisational structures. Small efforts have been done to stimulate the development of horizontal networks between small and medium-sized enterprises in the region. Thus, the local synergy effects and knowledge development that could stimulate innovations were limited (Qvortrup, 1997; Jansen, 1998; Gillespie et al, 2001).

3.2. The Current Role of ICTs in Rural Economies

Today, it seems to be a general trend that rural areas experience in general stagnation. A statistical analysis from EU DG Regional Policy Unit (EU 2010) shows that it has been stronger population decline in rural areas than in average. In Norway, in spite of a significant general population growth during the last 15 years, 2/3 of the municipalities have seen a population decline.² An even stronger trend is observed in Sweden.³

We do not at all claim that diffusion and use of ICTs are the cause of these development trajectories; we clearly see that penetration of ICTs is a prerequisite for development in all parts of our societies. Some would argue stronger, that without the massive adoption of ICTs in rural area, we would have witnessed even more dramatic migration patterns. We do however claim that the way ICTs are deployed are strengthening stagnation in rural areas, illustrated by some recent observations. Below we are revisiting some of the type of means and measures that were initiated 15–20 years ago and discuss whether such efforts are still relevant.

Building ICT infrastructure is seen as very important for regional development, and governments are still providing support to efforts aiming at building sufficient broadband capacity in most rural areas. Distant work gained significant ground among information workers in the 1990s. What remains however, are mainly “call-centres” and similar low-skilled work-places. Otherwise, it has rather become a type of *flexible work organisation* where employers are offered the flexibility to work from home one or more days during the week, while still commuting to the main office the other days. Consequently, the strategy for small, rural communities has changed from offering local work places based on telework to support sufficient broadband capabilities and other facilities that may it feasible to work from their home or cottage. This will, however, in general have limited impact on the local economy. Furthermore, distant teaching was one of slogan in the past, but has been replaced by *flexible learning*, which is not seen as a specific mean for promoting rural development.⁴ Telemedicine was rather successful in the earlier pilot projects in the past, and is today an important part of health service provision as ICT is becoming integrated in all parts of the health sector. However, seen from rural development perspective, it seems that telemedicine no longer do constitute an effective mean in itself.

An analysis of these initiatives using our framework shows:

² http://www.regjeringen.no/upload/KRD/Rapporter/Rapporter2013/Engelsk_analysekap_meld_2.pdf.

³ See <http://www.dn.se/nyheter/sverige/glesbygden-toms-pa-folk-i-allt-snabbare-takt/> Published 01-18-2012, In English: Rural areas are drained of people.

⁴ See R:1/2011: <http://norgesuniversitetet.no/om/skrift/12011-digital-tilstand-i-hoyere-utdanning-2011>.

Table 2. The impact of some rural development initiatives

Initiatives (ICT view)	ICT USE		
	Production	Management and control	Innovation & knowledge creation activities
Distant work etc. (Tool view)	Some efficiency	Some efficiency	No impact
Video-conferences, IT-investment (Infrastructure view)	Efficiency	Efficiency and some effectiveness	Negligible impact
IT-services (service view)	Some efficiency, minor effectiveness impact	Efficiency, minor effectiveness impact	Some support to innovation
Telemedicine (expertise)	Efficiency and effectiveness impact	Some efficiency, minor effectiveness impact	Help transformation

3.3. *Rural Economies in the Network Society: Growth or Absorption?*

Recognising the general centralisation trends in many societies, how can the use of ICTs help develop more vigorous rural communities? A recent EU-report (Karlsson et al, 2010) point out that ICT will have profound impact on regional development, but however in various ways. The adoption of ICTs allows the reduction of transaction costs and leads possibly to more efficient markets. In addition, the spread of ICTs is changing the labour market by generating new ICT occupations and at the same time changing the requirements for non-ICT jobs. Location choice is increasingly becoming governed by access to particular skills, technology, and knowledge as well as entrepreneurial talent and venture capital.

From the experiences in the past, we have seen that most policy initiatives were focusing on ICTs as infrastructure or as tools for achieving efficiency or better quality of existing products and services. These are necessary, but not sufficient conditions in order to help rural communities. The strategic use of ICT that can stimulate innovations and thereby strengthen local economies is essential. A major element of innovation processes is the ability and skill to combine information and knowledge from various sources with previous experience. This underlines the complex and highly nonlinear set of relationships between the various implications of ICT diffusion and adoption, as planned and non-planned, desirable and undesirable. Furthermore, the many elements of the innovation system and the innovative capacity of a regional economy facing the competitive pressures of globalization, represents a major challenge for policy at the regional, national and European level (Karlsson et al, 2010).

The European Network for rural development (ENRD) pays special attention to the ICTs by supports the development of ICT businesses, services, skills upgrading and broadband in rural areas in various ways as investments both in hardware and software are eligible in all programs. Such initiatives are of different types; i) basic services and infrastructure, ii) support the use of ICT in existing industries and iii) upgrading human capital and “e-skills”. This includes building broadband infrastructure and basic services (ICT service centre, e-services, ICT-tools stimulating co-operation etc.) along with the diffusion of ICT-equipment, and furthermore business creation. This is necessary, but not sufficient conditions for development of rural development.

Heeks (2009), in his report to OECD, points to the development from “ICD4D 0.0 to ICT4D 2.0”, characterized by a shift of focus from data processing to service and

Table 3. Illustration of the analytical framework applied on selected ICT-based rural policies

ICT View	ICT USE		
	Production: Operational	Management and control	Innovation, knowledge activities
Tool	<i>Policy measure:</i> No specific; marked-driven ICT diffusion <i>Impact</i> efficiency	<i>Policy measure:</i> No specific; marked-driven diffusion <i>Impact</i> efficiency	<i>Policy measure:</i> Upgrade e-skills, training, etc. <i>Impact:</i> no specific
Information Infrastructure	<i>Policy measure:</i> Support broadband building, etc. <i>Impact</i> Efficiency and effectiveness	<i>Policy measure:</i> Secure availability and stability <i>Impact</i> Efficiency and effectiveness	<i>Policy measure:</i> Support development of new services <i>Impact:</i> Facilitate transformation
Services	<i>Policy measure:</i> Support use of new services <i>Impact:</i> Effectiveness	<i>Policy measure:</i> Spur development of new services <i>Impact</i> efficiency and effectiveness)	<i>Policy measure:</i> Support innovative use of ICT <i>Impact:</i> Stimulate transformation
Expertise	<i>Policy measure:</i> Support access to information resources <i>Impact:</i> Effectiveness	<i>Policy measure:</i> Development of knowledge network <i>Impact:</i> Effectiveness	<i>Policy measure:</i> Support innovative projects <i>Impact:</i> Spur transformation

production. The goals have changed from efficiency to growth and development, and correspondingly to move from focus on the potential of technology to how we can apply ICTs to make it useful with greatest development impact. By mapping these different policies onto our framework as outlined below, we may better understand the possible impacts of these different policy initiatives.

We may conclude from the table that the ICT policy measures most often will imply efficiency impact, but few, if any of the policy initiatives will contribute to innovative activities on its own. Thus, an ICT strategy must be an integral part of the overall policies, but in a way that also can favour rural economies, in terms of competence building, support to utilise own resources, and to define a framework that help development of vital businesses (Barrios et al, 2008). Some suggestions can thus been made as premises for future rural technology policies.

Our analysis indicate that diffusion of ICTs (as tools) and the establishment of ICT infrastructure alone are more likely to entail centralised information handling than the development of local systems and increased value-adding activities locally. ICTs should not be seen merely as a tool, infrastructure and services that can increase efficiency, but also as a mean for cooperation and knowledge creation as basis for innovation.

There is thus evidence for that the diffusion of ICTs may follow different trajectories, both to exploit and impoverish rural areas, as well as to support competence build-up and knowledge creation activities. In general, we know that increased knowledge is the most important factor in order to benefit from the potential of new technologies. The vertical integration of local businesses into national structures may entail the local loss of essential knowledge about important processes in the value-addition chain. *Information* in itself is becoming the key strategic resource on which the production and delivery of goods and services in all sectors of the world economy will depend. A key strategy for a rural economy is thus to get access to, and as far as possible, to control the information created in the utilisation of the resources in the region and by that to stimulate the development of knowledge and competence through various types of learning processes. It is then important to maintain and develop the organisational and cultural context which can act as a basis for local knowledge creation and innovations.

These arguments do not imply that the ICT tools and infrastructures, supporting vertical connections to centrally controlled networks will have negative implications only for rural economies. As has been illustrated in this paper, such relationships are clearly a necessity for rural development, but such adoption patterns must not be the dominant types of ICTs use. A variety of trajectories for the diffusion of ICTs to rural areas may be supported and vertical governance structures have to be complemented by horizontal network between enterprises and individuals that can communicate and collaborate on equal premises, and in that way benefit all parties.

4. Conclusions

Our discussions have illustrated a rather evident fact; ICTs on its own do not favour rural areas. Geography does matter, and in spite of that ICTs ability to span distances, new technologies cannot compensate for the disadvantages that rural areas do possess in terms of lack of relevant knowledge and competence resources, etc. George and King (1991) conclusions “*that context and power structure dominates and takes form through management action in a manner best accounted for by reinforcement politics perspective*” seem to be still valid. In order to understand the impact of ICT, we need to understand the many dimensions of the ICT artefact as well as how it is used, which also imply to address mechanisms at different levels.

At a *macro level*: to explore how and to what extent ICT-based infrastructures can support growth in local economies. So far, ICTs seem to have contributed less to the creation of businesses and value creation locally etc. How to reverse such trends? Barrios et al (2008) states that “... certainly, infrastructure remains a key point, specifically, telecommunication infrastructure, for promoting regional development of innovative ICT activities. At the same time as policy efforts support infrastructure building, they should also promote ICT labour skills and the use of advanced ICT as these factors can improve the attractiveness of regions. However, policies promoting ICT diffusion must be part of broader industrial policies.

At an *organizational level*: A major trend in private businesses as well as in public agencies has been centralization, where ICT has been an excellent mean. Few public agencies have “outsourced departments or tasks to rural areas. Can such policies be changed? A major challenge is thus to implement means and measures that stimulate the establishment of horizontal networks.

At an *individual level*, to make life sufficient attractive in rural areas, were ICT to a large extent will help, when other premises are acceptable. Easy access to various networks through social media is expected to be an important factor, as its use is independent of space and time. It may have significant impact on people social and cultural identity. But they may not help people living remote if no other conditions are acceptable or viewed as favourable for other reasons.

References

- Barrios S., M. Mas, E. Navajas and J. Quesada (2008) Mapping the ICT in EU Regions: Location, Employment, Factors of Attractiveness and Economic Impact, EUR 23067 EN – 2008.
- Burlingame, J.F. (1961) Information technology and decentralization. *Harvard Bus. Rev.* 39(6), 121–126.
- EU (2010) Regional Policy n 01/2010, EU DG regional Policy. http://ec.europa.eu/regional_policy/index_en.htm.

- Heeks, R. (2008) ICT4D 2.0: The Next Phase of Applying ICT for International Development. *Computer* June 2008 IEEE.
- Heeks, R. (2009) The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development? Development informatics, Paper No 12, University of Manchester, ISBN: 978-1-905469-11-6.
- Hepworth, M. (1989) *Geography of Information Economy*. Belhaven, London.
- George, J. and J. King (1991) Examining the computing and centralisation debate. *CACM* 34(7), July 1991.
- Gillespie, A. and J. Goddard (1990) Telecom and what more? Paper to the seminar: On the regional Impact of Telecommunications services, Kiruna, 19–21 June 1990. DSTI/ICCP/TISP/90.19, OECD, Paris, 1990.
- Gillespie, A., R. Richardson and J. Cornford (2001) Article Regional development and the new economy EIB Papers, ISSN 0257-7755, Vol. 6, Iss. 1, pp. 109–131.
- Jansen, A. (1995) Rural development through diffusion of Information Technology. *Scandinavian Journal of Information Systems* Vol. 7 (1), Aalborg.
- Jansen, A. (1998) Technology Diffusion and Adoption in Small, Rural Firms. I.S. McGuire and T. Larsen (eds.) *Information Technology Systems. Innovation and Diffusion*. Idea Group Publishing, USA, 1988.
- Karlsson, C., G. Maier, M. Trippel, I. Siedschlag, R. Owen and G. Murphy (2010) ICT and Regional Economic Dynamics: A Literature Review EUR 24510 EN – 2010.
- Kling, R. (1987). Ch. 13 Defining the boundaries of computing across complex organizations. *Critical issues in information systems research*. R.J.B. Jr and R.A. Hirschheim, John Wiley & Sons.
- Kraemer, K. and W. Dutton (1979) The interests served by technological reform. *Admin. Soc.* 80–106.
- Leavitt, H. and T. Whisler (1958) Management in the 1980's. *Harvard Bus. Rev.* (Nov./Dec. 1958), 41–48.
- Markus, M.L. and D. Robey (1988) Information technology and organizational change: Causal structure in theory and research. *Manag. Sci.* 34(5) (May 1988), 583–598.
- Maung K.S. and G. Harandranath (2004) Conceptualizing the ICT Artifact: Toward Understanding the Role of ICT in National Development.
- Naisbitt, J. (1982) *Megatrends*. New York.
- Negroponte, N. (1995) *Being Digital*, 1995. ISBN 0-679-43919-6.
- Nora, S. and A. Minc (1980) *The Computerisation of Society. A report to the President of France*. Cambridge, Mass. MIT press.
- OECD (1997) Towards a Global Information Society 1997. OECD, Paris. [Http://www.oecd.org/](http://www.oecd.org/).
- Orlikowski, W. and C.S. Iacano (2001) Research commentary: Desperately seeking “IT” in IT research – A call to theorizing the IT artifact. *Information Systems Research*, 12: 121–134.
- Qvortrup, L. (1997) Information Society and Regional Development – the European Experience. I. Jæger and Storgaard (eds.) *Telematics and rural development*. Bornholm Reserch Centre, April 1997.
- Robey, D. (1983) Information system and organizational change: A comparative case study. *Systems/Objectives/Solutions* 3 (1983), 143–154.
- Rogers, E.M. (1995) *Diffusion of innovations*, The Free Press, New York. 4 edition.
- Toffler, A. (1980) *The Third Wave*. Morrow, N.Y., 1980.
- Whistler, T. (1970) *The Impact of Computerson Organizations*. Praeger Publishers, N.Y., 1970.

Design and Adoption of Standard Specifications using the V-Model

Ansgar MONDORF¹ and Maria A. WIMMER¹
University of Koblenz-Landau, Koblenz, Germany

Abstract. A key benefit of standards and commonly shared technical specifications in ICT is their role in facilitating interoperability. However, standards need to achieve market acceptance to create real impact. Underlying interoperability architectures need to be further developed, improved and maintained. The aim of this paper is to analyze, which dependencies exist between the conceptual design of standards on the one hand and their adoption on the other hand. Research has shown that dependencies between standard settings and adoption are not clearly described yet. Accordingly, this paper aims to investigate how standard-based interoperability architectures can encounter feedback of various implementations. The customization of V-Model as a development methodology shown in this paper aims to highlight lifecycle aspects between design and adoption phases. The concept of Business Interoperability Interface is integrated into the V-Model approach to demonstrate architecture demands during the architecture development. The case of E-Procurement in Europe is used to proof the concept of the proposed architecture and development methodology.

Keywords. Interoperability Architecture, Software Development Methodology, Business Interoperability Interface, V-model, E-Procurement

Introduction

Interoperability of pan-European e-government services is a complex challenge due to heterogeneities of systems, organizations, cultures, politics and laws in each Member State. The European Commission (EC) defined interoperability as “*the means by which the interlinking of systems, information and ways of working, whether within or between administrations, nationally or across Europe, or with the enterprise sector, occurs*” [1, p. 6]. According to the European Interoperability Framework 2.0, interoperability addresses the need of public administrations to cooperate with each other in order to establish public services and thereby to exchange information to fulfil political commitments or legal requirements [2].

To implement trans-European services and solutions, the public sector must address several challenges. The European Union Member States have defined interoperability as a political priority as it has the potential to have a high impact on businesses and citizens. Interoperability on legal, organizational, semantic and technical level is seen as a key factor in overcoming these challenges. In theory the following two basic strategies have been identified to enable interlinking of systems [3,4]:

¹ Corresponding Authors: Ansgar Mondorf and Maria A. Wimmer, University of Koblenz-Landau, IWVI, Universitaetstr. 1, 56070 Koblenz, Germany, E-Mail: {mondorf|wimmer}@uni-koblenz.de

- Centralization of tasks (Integration): Centralization of tasks means that formerly separate organizations integrate their data and processing functions through physical merging. Centralization requires a strong political will and pressure and implicates changes of authority and jurisdiction. As a result it turns out in many domains that centralization is politically not feasible or legally not possible due to many risks.
- Standardization of processes (Interoperability): The standardization strategy describes data interchange on the basis of similar procedures and data formats. Standardization not necessarily implies a change of internal back office processes and data formats, but a standardization of interfaces which can be used to enable electronic data exchange. When following the standardization strategy centralization of supportive functions (e.g. directory services) still might be required but primary tasks and responsibilities remain untouched.

Standardization is put into focus when centralization of tasks is politically or legally not possible. The European Interoperability Framework rather emphasizes on the need to standardize processes and data interchange in order to achieve interoperability. A necessary prerequisite to establish standards is their acceptance within domains. The EIF 2.0 highlights the need to involve public administrations actively into the standardization process in domains where no suitable formalized specifications are available. Even in cases where formalized specifications are available, they have to evolve over time. This results in a long time frame of standards development. Active government participation in standardization processes reduces concerns, improves alignment of local requirements and can help governments to catch up with technological impact and innovation [2].

The remainder of the paper is as follows: Section 1 investigates development methodologies introduced and discussed in literature to build architectures. In section 2, we chose the V-model and customize it to build an interoperability architecture. We propose a revised V-model based on three key phases: design, enablement and adoption. The revised V-model to design and adopt standards is exemplified for e-procurement in section 3. Finally, section 4 concludes with reflections and an outlook to further research.

1. Use of development methodologies to build architectures

Standards can be used to build an architecture foundation of interoperability initiatives. Architectures are a means to develop, structure and govern assets and building blocks. As there are different types of architectures (e.g. interoperability, governmental, enterprise), the concept of architecture lacks a common agreed upon definition [5]. Smolander [6] argues that it is difficult to conceptualize and define architecture because the meaning of architecture changes due to different types of stakeholders, the domains of interest and phases of projects. Janssen et al. [7] analyzed different government architectures in Norway and the Netherlands and conceptualized the impact and use of these architectures. Their key findings show that Governmental Architectures are usually built on four elements: common frameworks, architecture principles, architecture guidelines and standards. Zachman [8] introduced the concept of architecture frameworks which structures and interrelates architecture elements in order to allow design of elements ensuring coherence among elements. Architecture Principles are normative and directive statements guiding stakeholders in the design of complex information systems [9]. Architecture guidelines determine recommended practice allowing some degree of interpretation. Standards refer to a set of well-defined

specifications (or policies) which are used as rules to define common practices across projects and organizations [7].

The EPAN (European Public Administration Network) framework created by the e-government working group in 2004 defines governance of interoperability as being *“concerned with the ownership, definition, development, maintenance, monitoring and promotion of standards, protocols, policies and technologies that make up the various elements of an interoperability architecture”*². Interoperability Architectures are agreed approaches for common solutions. They specify sets of elements based on a holistic consideration. Building interoperability architecture includes understanding enablers and barriers for interoperability, working in collaboration with the different stakeholders. The European interoperability framework (EIF) highlights the importance of the standard setting process to reach interoperability architecture [1, 2]. The EIF recommends that when developing interoperable services with a pan-European dimension thorough analysis of the related business processes and actors, and agreement on architectural elements such as Business Interoperability Interfaces (BII) are necessary. Ziemann and Loos (2009) further concretize the BII concept by distinguishing between organization specific viewpoints (private view) which are out of the BII scope and globally defined actors, processes, documents and services (public view) which are assembled to a BII [10]. This paper uses the concept of BII including differentiation between private and public views in order to contribute to the research question how baseline interoperability architectures could be conceptualized and composed.

The Open Group Architecture Framework (TOGAF) is one of the most popular frameworks used for enterprise architecture management. Development methodologies thereby support conceptualization and composition of elements. Development methodologies in software engineering are frameworks used to structure, plan, and control the process of developing information system. Some well-known methodologies in this context are the waterfall model, spiral development, iterative and incremental development, prototyping and extreme programming [11]. TOGAF suggests the Architecture Development Method (ADM), a generic method which can be applied in different contexts and architectures [12]. By executing ADM, an architect can develop context-specific architecture as well as populating this architecture with architectural assets. Architecture development is an iterative process. By using ADM continuously the architect populates the architecture with relevant re-usable building blocks. The first execution of ADM is often time consuming since the architecture assets available for re-use are relatively few and not structured. Subsequent executions are easier because more architecture assets are available. Through development methodologies like ADM, architectures are moved from business oriented or abstract viewpoints towards implementation specific or concrete viewpoints [12].

Implementation viewpoints play an underlying role during the development of standards. They reflect organization-specific implementation needs while the standard itself reflects the public view. As a consequence other development methodologies than ADM were analyzed with regard to their suitability to distinguish between design and implementation viewpoints. An outcome of this analysis was that the V-model, introduced by Paul Rook [13] in the late 1980s, focuses on relationships between design tasks and associated phases of testing. The V-model is still in use today having several

² EPAN (2004), European Public Administration Network, e-government Working Group: Key Principles of an Interoperability Architecture. Brussels. http://www.epractice.eu/files/media/media_553.pdf, p. 7

customizations (e.g. V-model XT in Germany for the public administration³). The V-model uses a well-structured method where each phase builds upon the results and documentation of the previous phase. By reflecting relationships between design and test activities the V-model aims to improve efficiency and effectiveness [14]. In the context of interoperability architectures testing is of importance as adopters have to test their implementation against the underlying standards. Implementation and test results can generate feedback to interoperability architects involved in the standards setting process. Figure 1 shows dependencies between standard setting and adoption by distinguishing between public and private views.

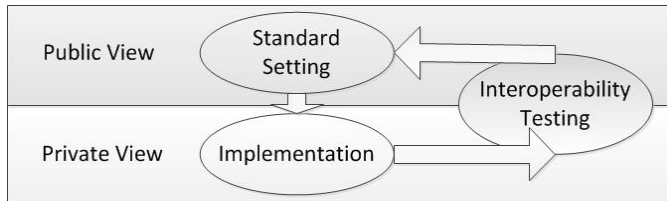


Figure 1. Dependencies between standards setting and adoption

A major challenge during the adoption of standards is to validate that different implementations work together. Testing can ensure that systems are implemented in conformity with underlying standards. Results of testing should be returned into the standardization process to get feedback from implementers. Therewith quality and usefulness of standard specification can be increased. Interoperability testing can be already considered and planned during the standard setting phase. Commonly defined testing methods increase the coherence, consistency and quality of standards and provide active support to their implementation. This may reduce the risk of fragmentation, duplication and conflicting testing efforts. In this way implementations are supported better and feedback on standards usage can be collected [15].⁴

2. Customized V-model to build Interoperability Architectures

A well-defined interplay between a standardization and implementation leads to an increase of maturity of the overall interoperability architecture. Standards describe public viewpoints thus they can be seen as interfaces of a business process. According to the EIF, Business Interoperability Interfaces (BIIs) can be described along the different levels of interoperability. The environmental scope and goals of a BII are described on the legal level. On the organizational level business processes and choreography of transactions is specified while the semantics of a BII describe the details of transactions through correlating information models and business rules. On the technical level information models need to be bound to appropriate syntaxes which fulfill the identified requirements and serve as a domain standard. Figure 2 shows a customized version of the V-Modell reflecting the different interoperability levels.

³ <http://v-modell.iabg.de/>

⁴ CEN Workshop Agreement (CWA 16408): Testing Framework for Global E-Business Interoperability Test Beds (GITB). European Committee for Standardization, Brussels (2012)

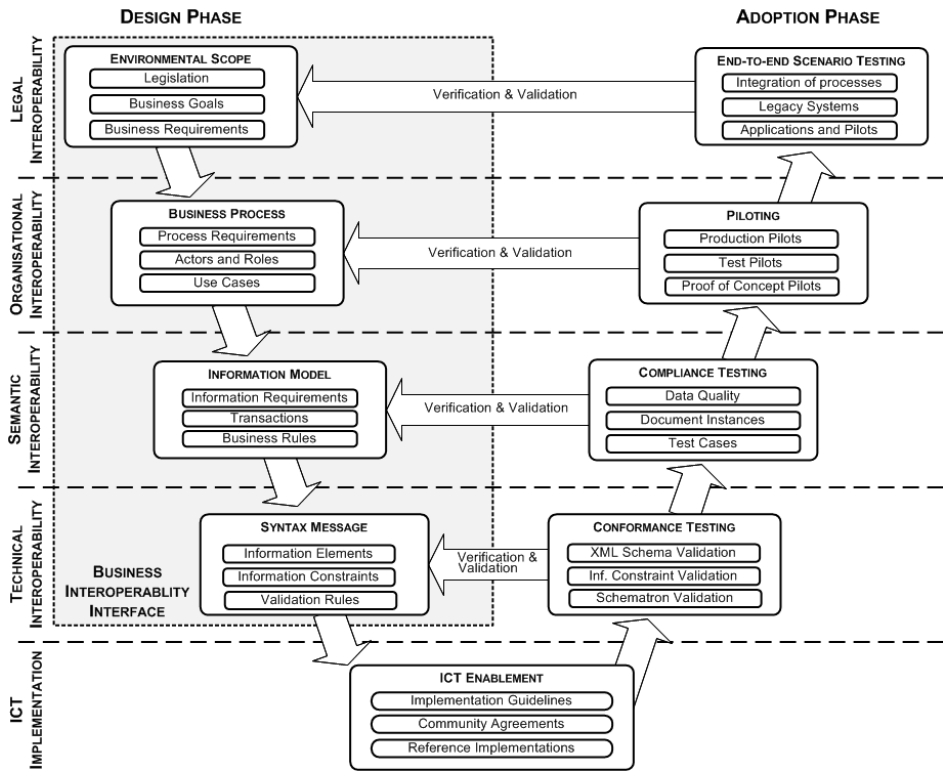


Figure 2. Design and Adoption of standards according to the V-model

For each interoperability layer of a BII, requirements play an important role. Business requirements are derived from the overall environmental scope and help to systematically detail and justify requirements on business process and information model level. They guide the design of the BII itself and they provide means during the adoption phase to validate and verify whether implementations fulfill the intended capability. Figure 2 shows interdependencies between the conceptual design of standards and adoption processes. The left side describes the specification of architecture elements ending with the start of the implementation phase. The implementation phase is followed up with different phases of adoption which are assigned to each step in the design phase as they provide feedback to them.

2.1. The design phase: Defining the Business Interoperability Interface

Scoping the business environment aims to understand the specific part of the business process (or business interoperability interface) that should be described and standardized. The most important reference for scoping the business process is the underlying (legal) framework of a specific domain. Identifying and describing the business goals of each interface according to the underlying (legal) framework are a precondition for defining correlating business requirements. The BII itself is answering the question how goals of a process (part) can be achieved.

The business process describes a sequence of activities identifying interfaces apart from private viewpoints. The choreography of the business process describes sequence of activities as well as transactions carried out throughout the process. The participating actors and their roles within the process are described from a business perspective. These partners want to achieve mutually agreed goals when implementing the interface. Process requirements are used to define and understand the goals of the interfaces and its transactions. Use cases and process models help to determine dependencies with precedent and subsequent activities.

Information models aim to describe transactions by interrelate information requirements defining cardinalities and relationships between information elements. Information requirements can be used to systematically describe the core information entities and their meaning within the transactions. They help to determine the rules governing the data (e.g. use of business terms, facts relating to each other, constraints or derivations). While information elements relate to the precise definition of semantics, business rules emphasize on the use of data within the organizational context.

Information models and requirements may be detailed using core vocabulary such as the Asset Description Metadata Schema (ADMS)⁵. Information requirements can be mapped to different syntax messages or standards as long as the chosen standard or vocabulary contains the necessary data elements. Information elements which are not part of the standard may be added and/or submitted to the standardization organization. Standards often provide customization guidelines to allow user communities to address requirements which are not met by the off-the-shelf solution. Most standards make use of XML syntax but there are ambitions to also standardize the semantics or meaning behind the syntax through languages like Resource Description Framework (RDF) or Web Ontology Language (OWL). Validation rules formalize the defined business rules using rule-based validation languages like Schematron.

2.2. ICT enablement: Implementing the Business Interoperability Interface

In terms of standardization, implementation can be viewed as a private task of adopters. Organizations that wish to implement a solution need to adapt the behavior defined by one or more BIIs. Standardization not necessarily implies a change of private processes and data formats (e.g. used in the back office), but an implementation interfaces which can be used to enable electronic data exchange. Standards may not be precise enough to enable a full implementation. User communities may detail certain elements through implementation guidelines (e.g. use of code lists and identifiers), they may create user agreements (e.g. to govern infrastructure elements) or they provide reference implementations to ease adoption processes.

2.3. The adoption phase: Testing the Business Interoperability Interface

The aim of testing is to proof if solutions are able to behave as defined by a BII. Conformance testing thereby helps to test whether software components are able to generate and understand correct document instances. Conformance testing ensures that outputs adhere to a syntax message and validation aspects such as document structure,

⁵ ADMS provides core vocabularies for elements such as Person, Service, Business and Location. Core Vocabularies are extensible data models that capture fundamental characteristics of an information element <http://joinup.ec.europa.eu/asset/adms/home>

cardinalities, data types, value ranges, code lists, references or value patterns. Conformance testing can be executed automatically on any document instance using conformance test systems that aggregate all test assertions

Compliance testing is a less structured challenge. It helps to check whether components comply with the agreed specified semantics of an information model. It can help to identify whether semantic requirements, rules and logic are clearly expressed by the specification. Compliance testing outcomes help to define appropriate and suitable conditions for piloting. Solutions may depend and rely upon processes which are not yet standardized or implemented. Test cases and document instances may help to identify gaps and issues. They also help to improve data quality providing feedback on the information model.

Outcomes of conformance and compliance testing help to determine appropriate and suitable conditions for piloting. Pilot solutions may be conveyed gradually from proof of concept pilot (narrow set up) and test pilot (real data/artificial process) into productive pilot environment (real data/real process). Different pilot types help to determine stepwise how systems behave in the overall environment.

End-to-end scenario testing emphasizes on the integration among legacy systems, applications and pilots to test system dependencies. Different elements may be combined to build a scenario for end-to-end testing. Systems should ideally behave as they were integrated. Testing scenarios may point to gaps of the underlying architecture (or environment) which leads to new or amended BIIs (or recommendation for legislative changes).

3. Interoperability Architecture for Public Procurement

This section aims to reflect the proposed architecture and development methodology. A key question in this context is how the implementation of interoperability architecture has been realized in practice? Standardization of electronic data exchange in the public procurement domain will be used to proof the concept. The case will help to demonstrate, reflect and analyze the approach taken.

In e-procurement several initiatives including harmonization of legal frameworks, standardization and piloting were launched during the last decade. This has resulted in great interoperability achievements and increased overall maturity of the underlying interoperability architecture. In 2004 the directives on public procurement (2004/17/EC and 2004/18/EC) introduced a common ground for national and European standardization initiatives. In public procurement, interoperability emphasizes on the interfaces related to pan-European electronic transactions. The different procurement phases can be distinguished into pre-award, award and post-award processes.

The CEN Workshop on Business Interoperability Interfaces in Europe (CEN WS/BII) aims *“to provide a basic framework for technical interoperability in pan-European electronic transactions, expressed as a set of technical specifications that cross-refer to relevant activities, and in particular are compatible with UN/CEFACT in order to ensure global interoperability”*⁶. The business interoperability interfaces (BII) are published as a set of technical specifications called WS/BII Profiles. WS/BII Profiles should facilitate the use of E-Procurement standards by suppliers and buyers, including

⁶ <http://www.cenbii.eu/>

public administrations. WS/BII Profiles describe specific parts of a process, where bilateral (or multilateral) communications are executed. Together they form the interfaces of the procurement process apart from private viewpoints. A WS/BII Profile is referencing its business transactions to information requirements and models, which describe the core information elements and entities on a semantic level. WS/BII Profiles are requirement driven and syntax neutral descriptions which focus on the standardization of legal, organizational and semantics aspects. On the technical level, information models are bound to XML documents and syntaxes from international standardization organizations such as UN/CEFACT e-Tendering ebXML Standards⁷ and OASIS Universal Business Language (UBL) 2.0⁸.

BII profiles can be seen as an aggregation of legal, organizational and semantic interoperability requirements in public procurement. It defines core elements that are required for understanding and implementing pan-European procurement transactions. Pan-European solutions developed in projects like PEPPOL (Pan-European Public Procurement Online)⁹ or ePrior¹⁰ implemented and piloted various WS/BII Profiles in pre- and post-award procurement. These pilot projects added implementation perspectives but the underlying WS/BII profiles remained the core concept of the interoperability architecture. Conformance test systems were created as part of the pilot projects in order to ensure adherence to syntax messages and validation rules. Compliance testing artefacts such as test cases and document instances helped to test and proof certain aspects of the intended pilot. In PEPPOL pilots were gradually raised from proof of concept to production status. The pilot projects provided valuable feedback to the further evolution of WS/BII profiles. This was mostly done through public conferences and active CEN BII workshop involvement. Beyond that results of piloting lead to recommendations which affected collection of best practices (e.g. Golden Book of e-procurement practices)¹¹, new regulations (e.g. proposal for a directive on e-invoicing in public procurement)¹² and revision of existing directives on public procurement (e.g. Directive 2014/24/EU replacing directive 2004/18/EC)¹³.

4. Conclusions

A key benefit of standards and architectures in ICT is their role in facilitating interoperability but it has to be ensured that both achieve market-place acceptance. Standards and architectures can be improved by integrating requirements and collecting feedback from implementers such as pilot projects. In this way standards and interoperability architectures can be improved, extended and maintained. The number of implementations may help to measure to which extent a standard has been implemented in the market or whether it is suitable to fulfill market requirements.

⁷ <http://www1.unece.org/cefact/platform/display/TBG/TBG6>

⁸ <https://www.oasis-open.org/committees/ubl/>

⁹ www.peppol.eu

¹⁰ <https://joinup.ec.europa.eu/software/openeprior/description>

¹¹ http://ec.europa.eu/internal_market/publicprocurement/e-procurement/golden-book/

¹² http://ec.europa.eu/internal_market/publicprocurement/e-procurement/e-invoicing

¹³ http://ec.europa.eu/internal_market/publicprocurement/modernising_rules/reform_proposals

The customized version of the V-Model shown in this paper is an approach which shows how design and adoption of standards interrelate and complement each other. Interdependencies between the conceptual design of standards and their adoption are summarized using the V-model development methodology. The V-model approach was chosen as it emphasizes on design and testing rather than on the implementation aspects. The proposed V-model customization provides a well-structured method based on the different interoperability layers of the EIF. Thereby each phase builds upon the results and documentation of the previous phase. The design phase described by the proposed V-model model has been combined with the architectural concept of a BII. Implementations may start once a BII has been defined. Implementations are supported with different phases of testing that correlate with the EIF layers that constitute a BII. Testing, piloting and scenario building provides feedback to the BII design, contributes to an increase of quality and helps to identify gaps within the overall interoperability architecture.

The paper does not explicitly specify how communication between designers and adopters should be carried out. The concept has been proven using the case of public procurement where feedback cycles were established through the interlinking of initiatives. Further proofs of the proposed concept might be needed for other cases and domains in order to conclude on its generality and validity. The paper focusses on the methodology to specify standardized BIIs to enable electronic data exchange and to test implementations accordingly. Aspects such as infrastructure components for document transport and signing are not part of the concept and point to possible future research work.

References

- [1] European Commission, Linking up Europe: The importance of Interoperability for eGovernment Services, 2003, URL: <http://ec.europa.eu/idabc/servlets/Doc2bb8.pdf>
- [2] European Commission, European Interoperability Framework (EIF) for European public services - Towards interoperability for European public services, Brussels, 2010.
- [3] R. Klischewski, Information integration or process integration? How to achieve interoperability, In: R. Traunmüller (Ed.). Electronic Government. Proceedings of EGOV, LNCS # 3183, Springer Verlag, Heidelberg, 2004, 57-65.
- [4] H. Kubicek, R. Cimander, Three dimensions of organizational interoperability. Insights from recent studies for improving interoperability frameworks. European Journal of ePractice 6 (2009), 13-14
- [5] M.S. Corneliussen, IT Architecturing: Reconceptualizing Current Notions of Architecture in IS Research. In: Golden, W., Acton, T., Conboy, K., van der Heijden, H., Tuunainen, V.K. (eds.) European Conference on Information Systems (ECIS), AIS, Galway, 2008, 494-504.
- [6] K. Smolander, Four metaphors of architecture in software organizations: finding out the meaning of architecture in practice. In: Conference Four Metaphors of Architecture in Software Organizations: Finding out the Meaning of Architecture in Practice, IEEE, 2002, 211-221.
- [7] M. Janssen, L.S. Flak, Ø. Sæbø, Government Architecture: Concepts, Use and Impact. In: Wimmer, M.A., Janssen, M., Scholl, H.J. (eds) Electronic Government: 12th IFIPWG 8.5 International Conference, EGOV 2013, LNCS # 8074, Springer Verlag, Heidelberg / Berlin, 2013, 135- 147.
- [8] J.A. Zachman, A Framework for Information Systems Architecture. IBM Systems Journal 26 (1987), 276-292
- [9] G.L. Richardson, B.M. Jackson, G.W. Dickson, A principles-based enterprise architecture: Lessons from Texaco and Star Enterprise. MIS Quarterly 14 (4) (1990), 385-404.
- [10] J. Ziemann, P. Loos, Transforming cross-organizational processes between European Administrations – Towards a comprehensive Business Interoperability Interface. In: Weerakkody, V.; Janssen, M.; Dwivedi, Y. (Eds.): Handbook of Research on ICT-Enabled Transformational Government: A Global Perspective, 2009, 93-116

- [11] S. Maheshwari, D.C. Jain, A Comparative Analysis of Different types of Models in Software Development Life Cycle. In: International Journal of Advanced Research in Computer Science and Software Engineering, 2 (5) 2012, 285-290.
- [12] The Open Group, TOGAF Version 9.1, Van Haren Publishing, 2009a
- [13] P. Rook, Controlling software projects, IEEE Software Engineering Journal, 1(1) (1986), 7-16.
- [14] S. Mathur, S. Malik, Advancements in the V-Model. International Journal of Computer Applications 1(12) (2010), 29–34.
- [15] A. Mondorf, M.A. Wimmer, D. Reiser, A Framework for Interoperability Testing in Pan-European Public Service Provision. In Wimmer, M.A., Janssen, M., Scholl, H.J. (eds) Electronic Government: 12th IFIPWG 8.5 International Conference, EGOV 2013, LNCS # 8074, Springer Verlag, Heidelberg / Berlin, 2013, 135- 147.

ICT-Enabled Policy-Making

This page intentionally left blank

A Collaborative Approach to Study Policy Modelling Research and Practice from Different Disciplines

Dragana MAJSTOROVIC^{a,1} and Maria A. WIMMER^{a,1}

^a University of Koblenz-Landau, Koblenz, Germany

Abstract. An OECD study of 2009 argues that open and inclusive policy making helps to improve policy performance and to meet citizens rising expectations. An important aspect shaping the success of policy making is the use of appropriate tools and instruments to model (public) policy, i.e. to use theories, methods and tools that support the process of transforming data and information inputs into conceptual and formal models, which contribute to transparency, a better understanding of policy options (the causes and effects), and better informed decision-making to improve public performance. Accordingly, policy modelling has recently emerged as a multi-disciplinary research domain advancing distinct approaches to policy development and governance through the use of innovative information and communication technologies (ICT). The complexity encompassed with modelling public policies demands for different - often distinct - political, economic, social and technical disciplines to work together to leverage the benefits of different approaches of understanding policy and designing innovative policy. This paper presents an approach to scientific collaboration in advancing the research field and in collaborating across distinct disciplines, while performing comparative analyses in the area of policy modelling. The comparative analyses are organised in the context of an international network of policy modelling called eGovPoliNet, whose aim is to overcoming the existing research fragmentation between disciplines, thereby driving evolution in the field.

Keywords. Collaborative research, comparative analysis, policy modelling, multi-disciplinary research

Introduction

Policy modelling has a great potential to provide an effective environment for the development and implementation of good governance and improved public performance [1]. Public policy is defined as “courses of action, regulatory measures, laws, and funding priorities concerning a given topic promulgated by a governmental entity or its representatives” [2]. Cochran et al refer to decisions of governments and to governmental actions and intentions when describing public policies [3]. Policy making is argued as a “work that is supported by the use of different theories as well as quantitative or qualitative models and techniques to analytically evaluate the past (causes) and future (effects) of any policy on society, anywhere and anytime” [4]. The complexity encompassed with modelling public policies demands for different - often distinct - political, economic, social and technical disciplines to work together to

¹ Corresponding Authors: Dragana Majstorovic and Maria A. Wimmer, University of Koblenz-Landau, IWWI, Universitaetstr. 1, 56070 Koblenz, Germany, E-Mail: {majstorovic | wimmer}@uni-koblenz.de

leverage the benefits of different approaches of understanding policy and designing innovative policy. This reflects a multidisciplinary nature of the field. However, traditional fragmentation between disciplines keeps researchers within their own disciplines that develop almost independently from each other. In order to fully address policy modelling challenges, researchers need to bring together their knowledge and share their expertise within a multidisciplinary collaboration.

Katz and Martin argue research collaboration as “working together of researchers to achieve the common goal of producing new scientific knowledge” [5]. While, traditionally, this assumed face-to-face meetings, new channels of academic collaboration became available with the rise of ICT solutions, among them web-based collaborative workspaces, internet discussion lists/newsgroups/real-time chat, screen- and application-sharing, web-based and conferencing, online web-page mark-up, etc. [6]. This enables researchers to organise in teams based solely on their interests and motivation without geographical restrictions. In this way, collaboration in teams becomes the main driving force of knowledge development [7].

eGovPoliNet is a research network to investigate the use of innovative ICT solutions for policy modelling and public governance.² It strives for overcoming the existing fragmentation of research of distinct disciplines and aims at improving the knowledge and innovation when it comes to providing a wide and successful deployment of ICT support in policy modelling. Thereby, a number of challenges has to be addressed; for example, appropriate support for non-experts in visualising and simulating policy models, wide adoption of online participation means for strategic decision making and open collaboration, enabling open collaboration and transparency in identifying the crucial features of complex social environments to feed policy models, etc. These challenges provide an opportunity for eGovPoliNet whose members have defined the network’s mission as to bringing researchers from distinct disciplines and communities together in sharing research ideas, discussing knowledge assets and developing joint knowledge with a goal of overcoming the existing research fragmentation within the field of policy analysis, modelling and governance. Figure 1 demonstrates the respective community values and benefits defined by the project members for the network participants. Accordingly, eGovPoliNet enables the community members from distinct disciplines to meet and discuss the different approaches to policy modelling and governance supported by ICT, to share new insights and learn from each other, and to collaborate in advancing and innovating the field.



Figure 1. Community value and benefits

A successful multidisciplinary collaboration requires finding common ground and goals for people and disciplines involved in a collaboration process [8]. For example, a pre-condition for a successful collaboration is a common understanding of key terms, concepts and solutions in a domain [9]. To facilitate the common understanding in policy modelling, eGovPoliNet started developing a Glossary³ of policy modelling

² eGovPoliNet is a coordination and support action co-founded under Framework Programme 7, Theme 5.6: ICT solutions for governance and policy modelling, <http://www.policy-community.eu/>

³ The glossary is available at <http://www.policy-community.eu/knowledge-portal>

terms (on-going work), which served also to initiate the collaboration among researchers from distinct disciplines. Subsequently, comparative analyses of important concepts shaping policy modelling have been initiated. The collaboration thereof is subject of study in this paper. The research questions driving this work are: What are the lessons learned so far from the comparative analyses, especially in regards to cross-disciplinary collaborations? What are the main characteristics of the collaborative approach to comparative analysis in policy modelling? What are the advantages and disadvantages of a multidisciplinary and collaborative approach to comparative analysis? Accordingly, we first outline the project's approach to comparative analysis in section 1. Subsequently, the collaboration of the network is analysed by assessing qualitative and quantitative indicators. The first indicators are elaborated by summarising the comparative analyses performed in Section 2, while the latter refer to the number of co-authors, institutions, countries, disciplines and professions collaborating within the comparative analysis as analysed in Section 3. Section 4 concludes the paper with a reflection and some outlook of future works of the policy community.

1. eGovPoliNet's Approach to Comparative Analysis

The process of collaboration as presented in Figure 2 shaped the multidisciplinary collaboration in comparative analyses within eGovPoliNet. First, the members representing distinct research disciplines were asked to propose themes that were, in their opinion, relevant to the policy modelling domain. Subsequently, relevant areas for the comparison were discussed among the members, which has led to the following nine topics (pool of themes) for the first round of comparative analyses (cf. Figure 2):

1. Theories of policy modelling
2. Modelling frameworks
3. Comparing simulation models of distinct modelling methods
4. Conceptual and domain models
5. Emerging tools and technologies
6. Technical frameworks and tools
7. Policies and programs framing policy making
8. Comparing projects / cases implementing policy
9. Stakeholder engagement in policy development

The topics were selected to cover different aspects of research and development of the ICT support in the area of public policy modelling and governance. The list of themes, rather than being exhaustive, represented a choice of important areas in the field of governance, participation and policy modelling, which mapped to the partners' competencies and profiles, and was pertinent to the field of study of eGovPoliNet. The comparison included existing approaches, reflected lessons learned and basic principles and recommendations for policy modelling. The teams exchanged their findings in a workshop as well as along regular monthly meetings (cf. Figure 2). As the outcome of the collaboration, papers have been produced that can be shared across the domains.

eGovPoliNet followed a multi-criteria approach [10] in performing the comparative analysis. A set of criteria was established for evaluating and comparing knowledge assets in the relevant themes of the ICT support for governance and policy

modelling by the respective work leader⁴. The criteria included different aspects ranging from general metadata to particular conceptual aspects. Also, a guideline for the comparative analysis was provided. The sets of criteria and the guidelines established for different topics served as a framework for the comparative analyses of different teams. A thorough literature review in the theme provided the foundation for adapting the evaluation criteria and methods for the respective comparative analyses.

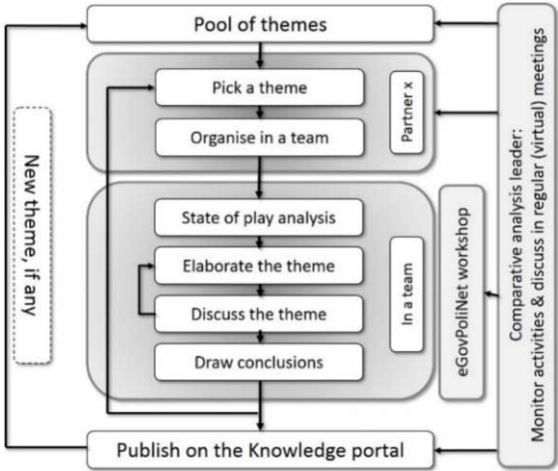


Figure 2. The eGovPoliNet collaborative approach to comparative analysis

2. Comparative Analyses Performed – Qualitative Indications

Among the main objectives of the performed comparative analysis were structuring, integration, comparison and formalisation of the existing approaches in the field of policy modelling with a goal of increasing transparency and accessibility of ICT solutions for governance and policy modelling as well as advancing on efficiency and effectiveness of future initiatives in the field. Table 1 presents a brief summary of the comparative analyses performed with extracted key points and lessons learned⁵.

Table 1. Brief summary of comparative analyses performed within the eGovPoliNet collaboration network

No. 1: How theories support policy modelling	
Key points	Lessons learned
Compared game theory, agenda-setting theory and institutional choice theory with respect to their roles and contributions in policy modelling	Combination of theories can contribute the most benefits for the research and provide a compensation for the shortcomings of individual theories alone.
No. 2: Frameworks in policy making	
Key points	Lessons learned
Identified and compared the main frameworks that are used in analysing policy-making processes Introduced a general classification of frameworks with regard to different degree of depth in the analysis	Frameworks are disseminated across distinct fields, such as public policy, political science, computer science and social sciences. With the growing development in the governance and technology, there is a rising need to develop categorisation criteria to be able to classify frameworks for policy analysis.
No. 3: Simulation models based on distinct modelling approaches	
Key points	Lessons learned
Examined different modelling approaches, each suitable for representing different aspects of socio-economic phenomena, such as	Using computer simulations in examining, explaining and predicting social processes and relationships as well as measuring possible impacts of policies should

⁴ Cf. Annex I to technical report D 4.2 available under <http://www.policy-community.eu/results/public-deliverables/>

⁵ Cf. Technical report D 4.2 available under <http://www.policy-community.eu/results/public-deliverables/> with the white paper contributions attached in Annex II

economic, demographic and nature processes. Compared simulation models based on different modelling approaches Examined advantages and disadvantages of the different modelling approaches	become an important part of policy making processes. Combination of different simulation modelling theories is not only beneficial for the policy making process but also a necessary as a next step in the evolution of simulation modelling. Such can be achieved by using a “clever” junction of a collection of self-contained mo-dels, each dedicated to a phenomenon to be modelled.
No. 4: Conceptual and domain models	
Key points	Lessons learned
Reviewed the field of conceptual and domain modelling and delineated research gaps and opportunities following a systematic literature review.	Currently developed models incorporate incomplete domain knowledge and do not include guidelines for a practical use of the models. Research on domain and conceptual models is immature and requires further investigation as only preliminary results are published.
No. 5: Emerging tools and technologies supporting policy modelling	
Key points	Lessons learned
Identified different categories of tools that have a potential of enhancing policy modelling processes, such as visualisation tools, argumentation tools, e-participation tools, opinion mining tools, serious games, persuasive technology, big data analytics, and semantics and linked data. Discussed their potentials and restrictions in policy modelling. Identified different stakeholder groups. Extracted recommendations for how particular ICT tools can be used in policy modelling and in which stage of the process.	Advancements in ICT offer great opportunities for modernising policy making process, where each tool or technology presents a different way for enhancing policy making processes. Policy making processes composed of distinct stages, which can be facilitated by tools and technologies. Necessary to analyse how specific stakeholder groups could use particular tools, and in what ways, to promote understanding of how these tools and technologies can be adopted in policy making processes. Most benefit generated by use of a mixture of suitable ICT tools, based on the stakeholder groups, targeted activity and the policy making stage to be supported.
No. 6: Technical frameworks and tools supporting decision making	
Key points	Lessons learned
Provided an overview of technical frameworks involving particular tools and technologies used for implementing simulation models. The analysis did not claim to be exhaustive in identifying all technological frameworks or tools and technologies, but rather served as a basis for the policy makers in identifying the potentials of technology frameworks, tools and technologies in decision making processes.	Identifying / selecting the methodology to develop simulation models is crucial. Comparisons between technologies or tools need to be conducted prior to choosing supporting technologies and tools. Specific situations require specific technologies hence the adoption of a particular modelling tool should not be considered to be set by default. Different existing frameworks should be examined to decide upon the one that will support the model.
No. 7: Framework of comparing policies, strategies and programs in e-government	
Key points	Lessons learned
Offered insights into the way trends in technological and societal development influence the process of designing and implementing policies, strategies and programs. Proposed a framework for comparative analysis of policies, strategies and programmes in e-gov. Examined the case of the European Union to evaluate the validity of the framework.	Different policies, strategies and programs were designed to improve the interactions in e-government and provide transparency. The proposed framework can be used to assess these policies, strategies and programs.
No. 8: Analysing projects / cases implementing policy in the field of sustainable / renewable energy	
Key points	Lessons learned
Examined theories and methods for policy implementations. Investigated the implementation of policies	A slow progress in switching from fossil fuels and nuclear power to renewable energy sources based on solar radiation, wind or water.

connected to the sustainable energy management and renewable energy sources through different projects and cases.	Necessary to carry out the dialogue across the world about the climate change and different possibilities to accelerate the adoption of renewable energy sources with the special accent on the financial issues. The use of renewable energy sources is expensive and funded by taxpayers and consumers, which is another reason for the slow progress. Necessary to raise awareness of the benefits of renewable energy sources, by including stakeholders and esp. citizens in the respective policy making processes.
No. 9: Stakeholder engagement in policy development	
Key points	Lessons learned
Compared examples of policies, where stakeholders were included in the policy modelling process. Discussed the strengths and weaknesses of stakeholder engagement during the phases of problem definition and the policy formulation. Contributes to a better understanding of how different approaches, tools, and technologies can support effective stakeholder participation toward better policy choices and outcomes.	Necessary to match selection of stakeholders and engagement methods to the goals of a policy process. Active involvement of stakeholders in policy modelling processes is an important factor for producing usable, transparent policies; useful for both groups, stakeholders as well as policy makers. Stakeholders and policy makers can collaborate in the wide variety of policy domains as well as various economic and social development. Engaging stakeholders helps establishing or reinforcing trust of citizens toward government.

3. Analysis of the eGovPoliNet Collaboration – Quantitative Indications

This section aims at describing and characterising the eGovPoliNet collaboration network, showing that researchers from different disciplines were engaged in the comparative analyses described in Section 2. This analysis is important with regard to the aims and objectives of eGovPoliNet presented in the introductory section.

For assessing a research collaboration, different authors suggested the assessment of the following aspects: co-authored papers [11], professions of the team members [9], disciplinary focus of the collaborators [12], geographical position of their institutions [12] and the organisational level of the collaboration [9]. We embark on these quantitative indicators for analysing the collaboration of the eGovPoliNet network.

Co-authored papers. A set of articles published as a result of the work of a collaboration network is the most common measure of successful research collaboration [13]. eGovPoliNet collaborations so far resulted in nine comparative analysis papers prepared by 27 authors. The mean number of authors per comparative analysis work (the so-called collaborative index of the network CI [14]) is 3.9. The degree of collaboration⁶ DC [15] representing a proportion of multi-authored papers compared to single-author papers is 0.78. For the eGovPoliNet network, the DC is high, which means that the vast majority of papers was produced in a scientific collaboration and not by single authors. However, CI and DC do not differentiate among varying numbers of authors in co-authored papers. For this reason, the collaboration coefficient CC⁷ [16] and its slightly modified version MCC⁸ [13] are

⁶ DC is in range between 0 and 1, being 0 for a collection where all papers are single-authored and 1 where all papers are co-authored by all authors from a collaboration network.

⁷ CC is in range between 0 and 1, being 0 for a collection where all papers are single-authored. However, it becomes 1 only for the infinite number of authors in the set. Because of this reason, MCC is used.

⁸ MCC is in the same range as DC.

used. For eGovPoliNet, the CC is 0.58 and the MCC is 0.6, which again evidence a high level of collaboration.

Profession of the team members. eGovPoliNet's comparative analyses were mostly performed by three types of professionals relevant to academic collaboration: researchers (23 out of 27 authors), students (3) and policy modelling practitioners (1). Since the focus of eGovPoliNet is a research community, it comes naturally that most of the team members are researchers, including a smaller number of PhD and graduate students and practitioners. Participation in multidisciplinary comparative analysis teams has proven to be an important environment for students to learn about the approaches of different disciplines and to obtain practical experiences in a scientific collaboration.

Disciplinary focus. eGovPoliNet objectives include a collaboration across disciplines. Table 2 gives an overview of the disciplinary backgrounds authors come from in the nine comparative analyses performed. Only two papers (no. 1 and no. 7) did not involve distinct disciplines as these papers were single-authored.

Table 2. Research collaboration of authors across disciplines in the performed comparative analysis

Research disciplines involved	Comparative analyses performed								
	1	2	3	4	5	6	7	8	9
Information Systems									
Computer science									
Social sciences									
Sociology									
E-government & e-participation									
Public administration sciences									
Economics									
Organisational and management science									

In working together in comparative analysis, the experts from distinct disciplines provided a unique view for the development and the usage of ICT solutions for policy modelling and governance. Briefly, the field of information systems is mainly dealing with a development of information and knowledge systems and tools that can be used in policy modelling, while computer science is concerned with the implementations of the presented solutions [17]. Social sciences and sociology focus their research on a variety of stakeholders and the interactions among them, for example, how to establish a trustworthy atmosphere in policy modelling process [17]. E-government researches complex digital interactions between a government and its citizens [17], while e-participation describes possible ways of participation and engagement of citizens in policy decision-making [18]. Finally, organisational and economic sciences develop interaction concepts based on effectiveness, productivity, transparency and a quality of services [17], [19].

Another important aspect is the internationalisation of the collaboration network, since the aim of eGovPoliNet is to engage researchers from different institutions from all over the world. Table 3 shows that the teams are internationally spread with the researchers coming from different institutions, ranging from information systems and technology institutes to social science centres and economic departments.

Organisational level of collaboration. The collaboration network of eGovPoliNet is organised at three levels as also indicated in Figure 2 above. First, members within comparative analysis teams established their own organisation. Through the regular monthly meetings and workshops, the teams exchanged and discussed their findings with other teams. Finally, a work package leader monitored the work of all teams.

The indicators presented in this section show that the eGovPoliNet collaboration is by all parameters a good practice example and analysing it can give hints for finding the (possibly hidden) variables supporting collaboration in policy modelling domains and hence enabling the transfer of best practices to other collaborations across disciplines.

Table 3. Disciplinary focus of institutions and countries the authors come from.

Country	Discipline	Performed comparative analysis								
		1	2	3	4	5	6	7	8	9
Germany	E-Government Research Group in a Faculty of Computer Science									
	Technology Assessment Institute									
Slovakia	Economics Faculty									
The Netherlands	Technology and Policy Management Faculty									
Greece	Technology Management Group									
United Kingdom	Information Systems School									
	ICT industry (SME)									
Belgium	Public Policy Institute									
Ireland	Data Analytics Group									
Canada	Information Systems Institute									
USA	Technology in Government Centre									
New Zealand	Social Sciences and Sociology Centre									
China	Information Systems and E-Government Institute									

4. Conclusion

To overcome the existing research fragmentation between disciplines within policy modelling, researchers from distinct disciplines need to work together in multidisciplinary collaboration teams, and their research findings need to be integrated to contribute to better understanding in the area of policy modelling. The paper described and evaluated the approach to scientific collaboration among different disciplines, which was applied to comparative analysis in policy modelling of eGovPoliNet. The goals of the comparative analysis were to structure, integrate and compare existing approaches and solutions in the field of ICT support for policy modelling with the aim of increasing transparency and accessibility to best practices, thereby driving evolution in the field. The eGovPoliNet collaboration scheme is multidisciplinary since it involves researchers from a number of different disciplines developing a common understanding out of single disciplinary fields. Researchers interact, discuss and bring conclusions together - a process that is evolution-driven,

since it fosters distinct related areas to draw lessons and conclusions from combining approaches which shall contribute to further evolution.

Two types of research and practice insights can be extracted from the performed comparative analyses: First, lessons and implications derived from the content of the distinct studies on policy modelling as summarised in section 2. Second, implications regarding multi-disciplinary collaboration as shown in the analysis in section 3, which has encountered a number of positive implications of the multi-disciplinary collaboration, such as:

- Experienced researchers share their knowledge with younger researchers.
- Researchers from distinct disciplines get a fast insight into the research of other communities and learn what is important from their point of view.
- Easier and faster contact with the top researchers and a literature insight from distinct fields.
- Better understanding of social and societal behaviour on the global level.
- Increased awareness among researchers that an interdisciplinary approach is necessary to bring the evolution in the field into motion and fill in current research gaps in the field of policy modelling.

However, negative implications were also encountered, such as:

- Collaboration teams from around the globe may find it difficult to meet due to different time zones and distinct scheduling of conferences across communities.
- Differences in understanding key terms and concepts as well as in cultural approaches to research and development are difficult to handle. The glossary of modelling terms helped to facilitate a common understanding across disciplines.
- Difficulties in establishing common research objectives and research questions due to varying viewpoints and expectations of rigor in distinct disciplines.
- Collaboration dependent on the willingness and readiness of individuals to accept a distinct approach and understanding from another discipline. If this precondition was not there, there would be no way of building up new knowledge for complex multi-disciplinary challenges.

Acknowledgements: eGovPoliNet is co-funded by the European Commission under contract number FP7-ICT-2011-288136. The authors would like to acknowledge the contribution of the eGovPoliNet partners to the comparative analysis work. The content of this paper represents the view of the authors, respectively. The European Commission cannot be made liable for any content.

References

- [1] OECD, "Focus on Citizens: Public Engagement for Better Policy and Services. OECD Studies on Public Engagement," OECD Publishing, 2009.
- [2] S. J. Evans, (Ed). Public Policy Issues Research Trends, Nova Science Publishers, Inc., 2008.
- [3] Cochran, C.E.; Mayer, L.C.; Carr, T.R.; Cayer, N.J., American Public Policy: An Introduction, Wadsworth: Cengage Learning, 2012.
- [4] M. Estrada, "Policy modeling: Definition, classification and evaluation," *Journal of Policy Modeling*, vol. 33, p. 523–536, 2011.

- [5] J. S. Katz and B. R. Martin, "What is research collaboration?," *Research Policy*, vol. 26, no. 1, pp. 1-18, 1997.
- [6] T. K. L. Schleyer, "Collaboratories: Leveraging Information Technology for Cooperative Research," *Journal of Dental Research*, vol. 6, pp. 1508-1512, 2001.
- [7] G. Melin and O. Persson, "Studying research collaboration using co-authorships," *Scientometrics*, vol. 3, pp. 363-377, 1996.
- [8] G. Laware, B. Davis and K. Perusich, "Initiating interdisciplinary projects: Finding common ground," in *Proceedings of the 2005 American Society for Engineering Education Annual Conference*, Portland, OR, 2005.
- [9] Amabile, T. M.; Patterson, C.; Mueller, J.; Wojcik, T.; Odomirok, P. W.; Marsh, M., "Academic-practitioner collaboration in management research: A case of cross-profession collaboration," *The Academy of Management Journal*, vol. 44, no. 2, pp. 418-431, 2001.
- [10] V. Belton and T. J. Stewart, *Multiple Criteria Decision Analysis. An Integrated Approach*, Massachusetts: Kluwer Academic Publishers, 2002.
- [11] J. M. Lewis, S. Ross and T. Holden, "The how and why of academic collaboration: disciplinary differences and policy implications," *The International Journal of Higher Education Research*, vol. 64, no. 5, pp. 693-708, 2012.
- [12] D. H. Sonnenwald, "Scientific collaboration," *Annual Review of Information Science and Technology*, vol. 41, pp. 643-681, 2007.
- [13] K. Savanur and R. Srikanth, "Modified collaborative coefficient: a new measure for quantifying the degree of research collaboration," *Scientometrics*, 2009.
- [14] S. M. Lawani, *Quality, Collaboration and Citations in cancer research: A 268 bibliometric study*, Ph.D. Dissertation, Florida State University, 1980.
- [15] K. Subramanyam, "Bibliometric studies of research collaboration: a Review," *Journal of Information Science*, vol. 6, pp. 33-38, 1983.
- [16] I. Ajiferuke, Q. Burrell and J. Tague, "Collaborative coefficient: A single measure of the degree of collaboration in research," *Scientometrics*, vol. 14, pp. 421-433, 1988.
- [17] M. Wimmer, "eGovernment as a multidisciplinary research field," in *Roadmapping eGovernment Research: Visions and Measures towards Innovative Governments in 2020*, Clusone, MY Print snc di Guerinoni Marco & C, 2007, pp. 12-14.
- [18] A. Macintosh, "Characterizing E-Participation in Policy-Making.," in *In Proceedings of the 37th Hawaii International Conference on System Sciences*, IEEE, 2004.
- [19] J. Perry and K. Kraemer, "Research Methodology," in *Public Administration Review*, pp. 1975-1984, 1986.

A Process for Combining Policy Formation with Innovative Design

I.T. HAWRYSZKIEWYCZ

University of technology, Sydney, Australia
igorh@it.uts.edu.au

Abstract. Policy formulation is now increasingly dynamic where policy has to be agile to reflect the changing behaviour in an increasingly complex world. An increasing requirement is for policy formulation is to become more adaptive and increasingly include design as part of vision and strategy setting. This is particularly important in the emerging complex environments where changing values need quick response. Thus as community values evolve ways to satisfy them are continually identified to ensure that change can be easily accommodated. The focus is on developing policy in solution neutral but meaningful terms while providing ways to respond quickly to policy changes through evolving projects. This paper proposes business building blocks combined with design thinking as a way to support such flexibility. Building blocks are now increasingly accepted as a way to build businesses whereas design thinking is finding increasing importance as a design approach that emphasizes innovation. It requires visualizations to help designers and policy makers to make sense of the complex relationships that exist in complex environments. The paper proposes a set of building blocks for policy formulation and illustrates how they can be organized for policy formulation.

Keywords. Policy, wicked problems, design thinking, building blocks

1. Introduction

The increasingly complex environment is calling for policy developments that support continuous innovation in an increasingly complex world (Merali, 2006). As a result policy can no longer be seen as predefined strategies with fixed goals but needs to continually innovate to cater for emerging society needs (Hobday, 2012). The environment now is one where policy development increasingly takes place in ill-structured or wicked environments. This paper provides a framework for policy making with complex or wicked environments (Head, 2013) that integrates policy with design on a continuous evolving basis. In such environments:

- There is no definite specific formulation or specification of the problem; there are just general goals such as increased sales in a new market, or increasing tourism in some region, or increased food security.
- Solutions are not true or false, but better or worse, there is no test of whether a solution will work as any solution can result in unpredictable behaviours of users and stakeholders.
- The environment here is one of increased social networking where many issues are resolved by collaborative engagements between stakeholders where trade-offs are made in the light of deep engagements intended to arrive at mutually acceptable solutions.

- The solutions are made more difficult as they often lead to changes in behaviour, which requires further change to the solutions.

The framework centers on complex meta organizations (Gulati, 2013) where an increasing number of open systems are strongly interconnected in networks where outputs of one become inputs of another (Whelton, 2002). Such strong interconnections must be factored into policy in areas such as:

- Smart cities (Macomber, 2013) including ways of living in increasingly larger and growing cities while conserving energy needs and providing services to citizens. These may include issues such as safety, energy use or increasing green areas, where all of these need to be put together to create a smart city.
- Addressing current social issues such as obesity or unemployment in society. These typically cannot be solved using analytical or predefined solution and need increasing social solutions to change behaviour as for example improving health, or raising educational levels. Here continuous interaction between stakeholders is needed with changes gradually introduced with stakeholder agreement.
- Global supply chains to arrange delivery of services that lead to improved health or education, including logistics systems in the delivery of materials including food supply, especially in underdeveloped regions (Cozzolino, 2011). Here collaborative structures between firms in the supply chain must be implemented to support smooth flow of materials.
- Collaborative systems to provide access to energy, food and water (Tellis, 2008) that is now emerging as an issue in emerging economies. Many systems here are driven through top level directives but involve local agencies in the planning cycle to ensure local needs are considered and are addressed through continuous evolution.

The framework proposed in this paper focuses on the two major characteristics of these systems, namely greater focus on social interactions in creating solutions, and the ability to continually innovate. It then supplements it with building blocks to provide the ability to organize the large volumes of information in these environments. To do this it combines:

- Design thinking to encourage innovation through collaboration,
- The agility needed to learn and quickly respond in innovative ways to change, and
- Building blocks to provide a way to experiment with alternatives in meaningful terms.

2. Design Thinking in Policy Development

Design thinking (Martin, 2009) supports innovation within an environment of change. The main advantage of design thinking is that it is a socially oriented design method where decisions are made in a collaborative manner. The new systems place greater emphasis on values perceived by stakeholders with explicit measures taking secondary. This is consistent with policy formulation where ideas are sought from a variety of stakeholders, who often contribute collaboratively (Hung, 2013) to policy ideas and

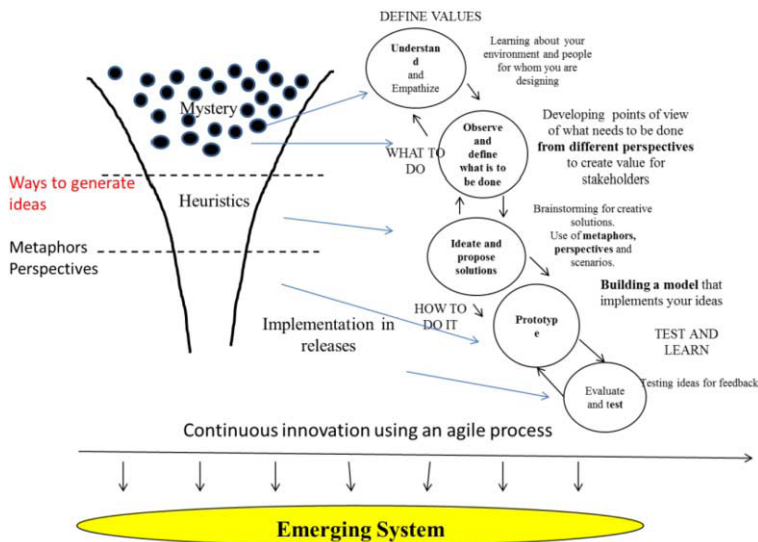


Figure 1. Design Thinking.

must agree to any proposed solutions. Figure 1 illustrates the idea. Here what is needed in policy is seen as a mystery – what are values of society, how will behaviour change. We then look at heuristics, following a search from different points of view that lead to possible solutions. Design thinking addresses two important differences between wicked problems from traditional methods are: There is more emphasis on business model innovation rather than re-engineering.

Design thinking supports an agile process that starts with developing a clear understanding of stakeholder points of view and then ideating using the heuristics as guidelines. It focuses on first analyzing existing systems into detailed stories and then putting or converging these stories into new systems. This process is continuous and solutions are released in steps following an agile development process. Design thinking thus places considerable importance on continually engaging people to work directly to resolve problems in their context. Its goal is to encourage research experimentation in business models. The emphasis in design thinking is on collaboration to develop solutions through innovation as stakeholders add and change features and through learning and continuing collaboration continuously improve the systems. Design thinking is seen in this paper as an emergent method for business system design. The design thinking activities are also illustrated in Fig. 1. They begin by developing an understanding, then define solutions, prototype them and evaluate. It differs from traditional methods in that:

- All stakeholders are involved at each stage, and
- Design thinking is a continuous process, not just one off. Often a design process is followed to release a new system we learn from it and then continue with the next release.

An important part of designing thinking is the canvas and presentations or visualizations on the canvas to foster experimentation and collaboration. All the information collected is presented on a canvas to raise awareness across all teams. The canvas is a

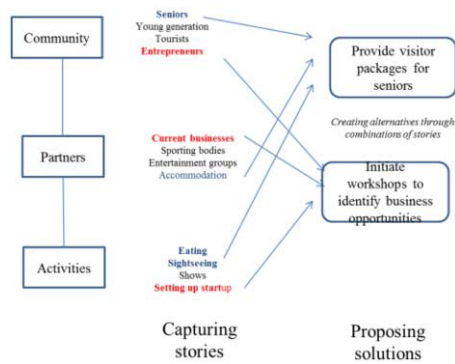


Figure 2. The idea behind building blocks.

presentation of the current state of thinking about the problem, people’s points of view, suggested solutions and comments on these. The important factor is that to reach a holistic solution requires collaboration and a continuous evolution on the canvas on the current state of thought.

3. What Are Business Building Blocks?

An approach increasingly used in design science is building blocks. In this paper they are seen as providing a solution to encourage communication and raise awareness. Building blocks support experimentation on business models. Stakeholders record their points of view and suggestions against the building block and then collaborate at examining the business possibilities provided by different combinations. We gather stories related to each building block and combine them into a proposal. In the example in Fig. 2 there are three building blocks – communities, partners and activities.

Stories are placed into each building block. For example the stories for the community include seniors, younger generation, tourists and entrepreneurs. Stories are generally longer but are only single words here for illustration. Experiments or suggested solutions are then proposed as combinations of stories from the building blocks. From a design viewpoint the building blocks can be seen as a conceptual model of a business or in the case of policy, a conceptual model of policy formation and implementation.

4. Organizing Building Blocks into Levels

Figure 3 shows a way to organize building blocks into levels that correspond to the political, administrative and project levels that characterize policy formation. The overriding theme is to keep the policy issues open while providing scope to respond to change in innovative ways. These are then used in the mission canvas to determine the key activities to meet the key requirements. It is also aligned to political, administrative and project levels of any policy framework. In summary:

- The vision level defines how to realize stakeholder values in *solution neutral terms*. The focus on solution neutral is important as we want to start in an

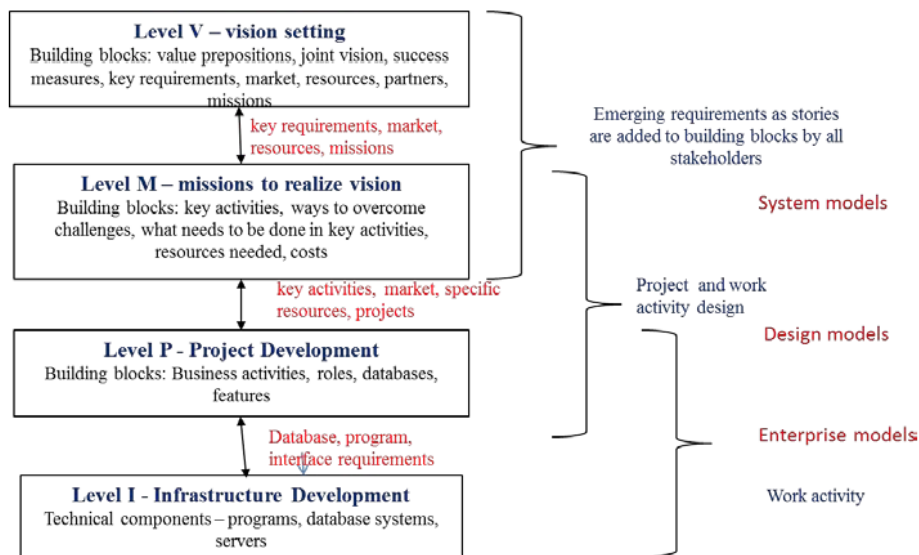


Figure 3. Integrating the levels.

open way to encourage innovative suggestions from stakeholders. In practice it is almost a political formulation of the goals and aspirations of the communities. Here policy makers or the enterprise decides on the key requirements to be met for the policy to be effective. The main dimensions here are the vision, the key requirements. The key requirements define what we would like to be happening in our system. For example “Customers are finding our designs attractive and as a result sales are increasing”. It is the way we want our business or society to operate.

- The next level identifies the missions – or what must be done to realize the key requirements. It corresponds to the administrative processes that must be put in place to realize the vision. In the case of the apparel organization it is that it must develop the best designs – what we have to be good at. The missions identify the key activities at which we must be competitive and projects based on these activities. These are our key activities. For example “We must become competitive in identifying trends”, or “We must develop procedures to be able to quickly respond to design trend”. Thus Fig. 5 indicates what we must be good at – manufacturing, selling and identifying good areas in which to sell. A mission identifies the projects that lead to the development of our key activities.
- The next level the project level defines the specific actions to be taken.

The advantage of this approach is the double loop learning.

5. Choosing the Building Blocks

The paper now describes the building blocks (Sinfield, 2012) for each level.

Value Propositions What are the needs of the different stakeholders?	Key Partners How different partners must work together?	Key Activities What must we be good at to realize the key requirements?
Key Requirements What We would like the system to be?	Key Resources What do we need to create the create a better system?	Market Who will be the customers and participants?
Costs What are the costs needed to create and run the new system?		Revenues Where will the revenues come from?

Figure 4. Osterwalder’s business model framework.

Issues Perceived issues?	Vision Where society should be? Identifying values of different social groups.	Environment Scanning What is happening?
Learning and Analysis Assessing information through relationship to themes	Creating Options Carrying out special studies between themes.. Generating ideas to respond to issues. Building models. Analyzing scenarios.	Policy Decisions Selecting options and agreeing on implementation
Assistance and partners Where is assistance needed?	Monitoring What are the success factors?	Administrative issues
Costs What are the costs needed to create and run the new system?		Revenues Where will the revenues come from?

Figure 5. Policy Vision Level.

5.1. The Vision Level – Identifying the Values and Setting Key Requirements

At this level we focus on society values and how to realize them. In our proposal we first address questions in a solution neutral way. Osterwalder’s (2010) building blocks serve as a guideline for vision development. These have been mainly used in strategic planning in business and are summarized in Fig. 4.

In this paper we apply this idea of general solution neutral terms to policy and propose the building blocks shown in Fig. 5.

We now illustrate how these building blocks can be combined to create policies. These are illustrated by Tables 1 and 2. The table entries are limited in size due to space limitations; in practice these are often post-it notes with different colors often used to notes that correspond to different building blocks. These focus on policies used to attract tourists to a city.

Table 1. Setting Policy Parameters – Developing value prepositions and policy options

City value Aspirations, Competiveness	Social values	Joint value	Environment scanning	Learning and analysis	Options	Decisions	What are the success measures
Improve connections between services **** Increase interest in tourism *	Maximize experiences in minimum time	Provide a wider range of shopping services within easy reach of each other	There is increased travel by senior citizens	We provide a startup center for business innovators	Working with local council to develop green areas	Investigate ways to pro- vide leading edge smart services to tourists.	Increased revenue for city businesses
Create business activities to provide work opportunities	Easy access to entertainment	A place where citizens can easily access services in their everyday life	Our city has a large number of entertainment groups	We provide a startup center for business innovators	Support start up companies that develop unique smart services for tourists	Develop bicy- cle ways and rental facilities to facilitate fast travel.	Increase in tourism
Improve safety	Green spaces for enjoyment		There are many sporting activities in the city				Reduced crime
Create greater community sense	Better opportunities for business and innovation	Citizens and city work together to maintain safety	There is increasing use of sensor devices				New businesses setting up in city
		Make it easier to move across the city					
		Provide guides for tourists to quickly move through their preferred experiences					

Note: The stories marked ***** can be combined into a policy goal

Table 2. Identifying Key Activities and Missions

Proposed missions and how they satisfy vision	Key activities to address the key requirements	Market needs addressed by the mission	Key Requirements addressed by the mission	Key resources required	Systems and Partners	Ways the missions address challenges	Success parameters for missions
Improve movement through the city	We will develop leading edge transportation for people to move around the center	Elderly will find it easy to move through the city	There will be services that attract people to come and stay at the city for long periods		Sporting associations	Finding space for new shops and entertainment venues	Widespread use of new services
Provide a range of activities to suit tourists	We will find entertainment for the elderly	Families with children looking for playgrounds and shows	There are a variety of activities to do in the city		A wide range of entertainers		
Improve experiences in the city	Use mobile technology to inform tourists of emerging activities	Younger generation looking for exiting experiences	It will be easy for visitors to move through the city between tourist activities		Tourist companies that can provide brochures as well as a reservation service for guides		
	Develop smarter products and services						

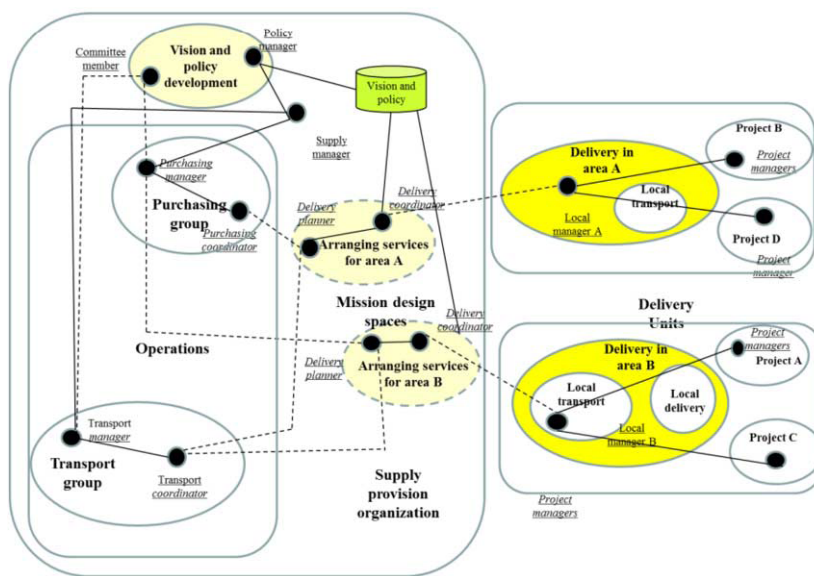


Figure 6. System of Systems Model.

Table 1 shows how the building blocks are used in vision setting level. Each column in Table 1 represents a building block with stories relevant to that building block listed in the column.

Our ultimate goal may be to “Develop a reputation as a cutting edge technical city that provides unique experiences to tourists”.

We then define projects to realize this mission.

5.2. The Mission Level – Developing an Implementation Plan

At this level we begin to look in more detail at the systems, persons involved and their interactions. Candidates for modeling include agent network theory as this focuses on social relationships. The context in such systems is continually evolving and as such can effect the behaviour of groups within the system. Our proposal here at best is to focus on agent network theory while including artifacts as agents within models. Such artifacts can for example include policies which are often outside the scope of a particular community but which effect community behaviour. In this sense although social networking provides a foundation it must nevertheless be moderated by social interactions taking place within a business context.

The top priority mission here may be to “Provide each tourist with a customized electronic service to guide them through their preferred experiences”.

Once missions are defined modelling and visualizations can be used to describe policy designs.

5.3. System of Systems – Defining the Role of the Main Players

Figure 6 is a model that shows a number of systems and interactions between them. The system of systems method can be used to model complex organizations (Lane,

1993). Each of the ellipses in Fig. 6 is a business unit, roles are shown as black dots. This provides a framework where knowledge flows can be directed between systems. Collaboration between systems can be rearranged when needed by creating a new collaborative group as is now becoming important in complex systems. A collaborative group is assigned a role. This role is allocated to a role in the system in the collaboration. This assignment is shown by the dotted line. For example, the planning group has the role planner. This role is taken by the CEO and the sales and manufacturing role to show that they jointly participate in making a plan. Here each system can organize itself as needed while knowledge flows are organized through boundary roles. A system of systems model provides a better basis for modelling collaboration when compared to traditional organizational models. Here the business enterprise is modelled as the “business Enterprise” and its units are also modelled as systems – in this case as organizations within the organization. The businesses with which the business enterprise trades are also modelled as systems. Collaboration is shown as systems, which are modelled as dotted lines to indicate they are virtual. Thus there is a planning group and two collaborations with the buyer businesses. Models like that shown in Fig. 4 are often useful in solution dialogs, especially when modelling relationships between different systems, as often needed in wicked environments.

6. Supporting Software for Story Collection and Awareness

What should design spaces look like? Literature suggests that design spaces be organized as a combination of models, questions and narratives, and visualizations where stakeholders can focus on a problem with a solution emerging as a model while bringing their tacit knowledge to suggest innovative developments in the model.

Figure 6 shows design space activities and the way of linking them in the design space network. Each design space:

- Supports strong collaboration through narratives,
- Experimentation and evaluation of any ideas.
- Produces an outcome that suggests actions, possibly carried out in other design spaces.

Linking between design spaces is through sharing of narratives as well as individuals who participate in more than one space.

7. Summary and Future Work

The paper addressed ways to facilitate policy formation in complex or wicked environments. It proposed design thinking as meeting the need for greater social engagement needed in policy development while at the same time providing a structure to organize such engagement. The structure was based on business building blocks that are organized into levels that begin with a vision stated in solution neutral terms followed by its translation to possible designs. The paper defined a set for building blocks for policy making and illustrated their application using a simple example.

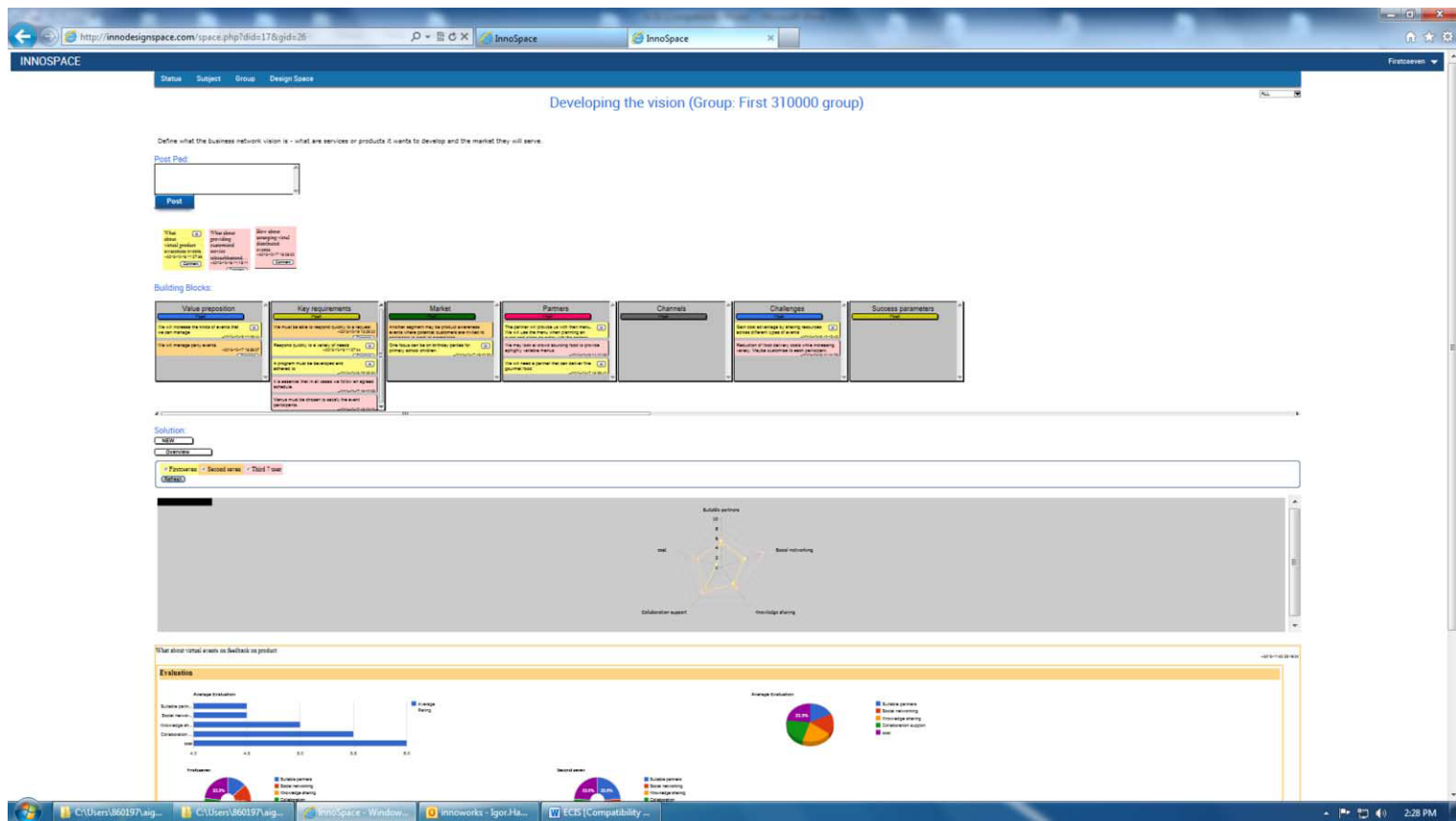


Figure 7. A CANVAS on a compute.

References

- Camillus, J.C. (2008): "Strategy as a Wicked Problem". *Harvard Business Review*, May 2008, pp. 99–106.
- Cozzolino, A., Rossi, S., Conforti, A. (2011): "Agile and lean principles in humanitarian supply chain". *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 2, No. 1, pp. 16–32.
- Doz, Y., Kosonen, M. (2010): "Embedding Strategic Agility: A Leadership Agenda for Accelerating Business Model Renewal". *Long Range Planning*, Vol. 43, pp. 370–382.
- Gulati, R., Puranam, P., Tushman, M. (2013): "Meta-Organizational design: Rethinking Design in Inter-Organizational and Community Contexts". Special Issues on Strategy and the Design of Organizational Architecture, *Strategic Management Journal*, Vol. 33, No. 6, June 2012, pp. 571–586.
- Hawryszkiewicz, I.T. (2013): "A System of Systems Approach to Managing Emergence in Complex Environments". *IFIP WG. 8.6 International Working Conference on Transfer and Diffusion of Information Technologies*, Bangalore, India, June 27–29, 2013, pp. 587–595.
- Head, B.W., Alford, J. (2013): "Wicked Problems: Implications for Public Policy and Management". *Administration and Society*, March 28, 2013, pp. 1–29.
- Hobday, M., Boddington, A., Grantham, A. (2012): "Policies for design and policies for innovation: Contrasting perspectives and remaining challenges". *Technovation*, Vol. 32, pp. 272–281.
- Hung, W. (2013): "Team-based complex problem solving: a collective cognition perspective". *Educational Tech Research Development*, Vol. 61, pp. 365–384.
- Johansson-Skoldberg, U., Woodilla, J., Cetinka, M. (2013): "Design Thinking: Past, Present and Possible Futures". *Creativity and Innovation Management*, Vol. 22, No.3, pp. 121–146.
- Macomber, J.D. (2013): "Building Sustainable Cities". *Harvard Business Review*, July–August 2013, pp. 39–51.
- Martin, R. (2009): "The Design of Business". Harvard Business Press.
- Merali, Y., McKelvey, B. (2006): "Using Complexity Science to effect a paradigm shift in Information systems for the 21st. century". *Journal of Information Technology*, Vol. 21, pp. 211–215.
- Osterwalder, A., Pigneur, Y. (2010): "Business Model Generation". John Wiley and Sons.
- Richter, M. (2013): "Business Model Innovation for sustainable energy: German utilities and renewable energy". *Energy Policy*, Vol. 62, pp. 1226–1237.
- Sinfield, J.V., Calder, E., McConnel, B., Colson, S. (2012): "How to Identify New Business Models". *MIT Sloan Management Review*, Winter 2012, Vol. 53, No. 2, pp. 84–92.
- Tellis, A.J., Kuo, M., Marble, A. (2008): "Asia's Water Security Crisis: China, India, and the United States". The National Bureau of Asian Research.

Fusing Open Public Data, Prosperity Indexes, Fuzzy Cognitive Maps and Argumentation Technology for more factual, evidence-based and accountable policy analysis and evaluation

Ourania MARKAKI^{a,1}, Panagiotis KOKKINAKOS^a, Sotirios KOUSSOURIS^a, John PSARRAS^a, Yuri GLICKMAN^b, and Habin LEE^c

^a*Decision Support Systems Lab, School of Electrical and Computer Engineering, National Technical University of Athens, Greece*

^b*Fraunhofer FOKUS, Germany*

^c*Brunel University London, UK*

Abstract. This paper introduces a novel and innovative approach for more factual, evidence-based and accountable policy analysis and evaluation, based on the pillars of open public data, prosperity indicators, fuzzy cognitive maps, argumentation technology, deliberation platforms and social media. The approach assumes making better use of Europe's open public data resources and aspires to enable both the lay public as well as domain experts to create, apply, annotate, share and discuss progress metrics and causal models of policies, with the view to support them in assessing the governments' course of actions, and enhance thereby the transparency and effectiveness of the policy analysis and monitoring phases of the policy cycle.

Keywords. Policy Making, e-Participation, Policy Analysis, Policy Monitoring, Open Public Data, Prosperity Indexes, Fuzzy Cognitive Maps, Argumentation Technology, Deliberation Platforms.

1. Introduction

1.1. Connecting people with policy making: the role of e-Participation

Engaging and involving citizens in political life is a considerable challenge at both EU and international level [1], that is nowadays reinforced and magnified by the latest developments in Information and Communication Technologies (ICT) and the advent of the Web 2.0 paradigm (thematic blogs, wikis, online polls, discussion fora, online communities, etc.) that are currently transforming the way citizens and the civil society interact, debate and participate in public life. Today, ICT and the World Wide Web play in fact an essential role in making participation in policy making and political processes [2] possible at large, by fostering communication and interaction between

¹ Corresponding Author.

politicians and the civil society, simplifying decision making processes, demystifying legislative texts and allowing to effectively visualize arguments and impacts of proposed decisions, thereby enabling citizens to reach more informed opinions, on the political decisions being taken and the way in which the latter affect their lives. In this context, e-Participation, defined as the ICT-supported participation in governance procedures, is about connecting ordinary people with politics and policy making, and thereby rendering decision making processes easier to understand and follow [3].

1.2. Current challenges for effective policy evaluation

Broadening and deepening political participation through the use of ICT is in fact quite essential, since in representative democracies, citizens elect candidates for public office on the basis of the values, goals and policies put forward by them during political campaigns. To hold elected officials accountable or effectively exercise their voting rights, citizens need to evaluate, based on empirical facts and evidence, whether government policies are working and elected representatives have promoted the values, achieved the goals and implemented the policies promised in their campaigns.

The relationships though between policies, their theoretical foundations and their outcomes are often difficult for citizens to assess: Internet has made readily available a wealth of information, cultivating though in parallel misinformation and intentionally propagated falsehoods from questionable sources, making it increasingly difficult for citizens to come to a common understanding of facts. At the same time, the criticism received by existing metrics for measuring progress and prosperity have hindered the establishment of a suitable and comprehensive framework for that purpose. Finally, the difficulty of tracking political events, such as the election of government officials and representatives or the enactment of legislation to their practical effects has been a factor greatly preventing citizens from reaching well-informed opinions about the effectiveness of applied policies.

In this context, and assuming that the policy cycle encompasses the phases of agenda setting, analysis, adoption, implementation and monitoring [4], better tools are required for critically assessing the causal models or theories underpinning policy proposals for achieving government goals in the policy analysis phase, so as to compare alternative policy scenarios and approaches, as well for evaluating whether some implemented policy has in fact produced the promised benefits in the policy monitoring phase, so as to hold elected governments accountable and better inform voters during elections, but also in order to help policy makers to take corrective action.

Based on this observation, the present paper aims at presenting a new and innovative approach for improving the quality and transparency of the policy analysis and evaluation phases of the policy cycle for both the lay public as well as for professional policy makers. This approach brings together open public data, prosperity indicators, fuzzy cognitive maps (FCMs) as a modeling technique for representing social scientific knowledge, and argumentation technology, and blends the latter with deliberation platforms and social media to provide better tools on the World Wide Web for constructing, sharing, visualizing and debating progress metrics and causal models of policies. The approach is twofold, i.e. it targets on the one hand to enable better use of open data sources and on the other it aspires to empower a variety of stakeholders with advanced modeling and visualization capabilities.

The paper is structured as follows: Section 1 discusses the role of e-Participation in promoting citizens' informed and democratic engagement and brings forward current

challenges for effective policy evaluation, setting up the objectives of the research approach presented in this paper. Section 2 introduces the proposed approach, identifying its main ingredients as well as the key capabilities offered. Section 3 focuses on each individual pillar of the proposed approach, emphasizing on the most important developments in each domain as well as on the advancements brought by the envisaged policy evaluation framework, which actually come up as a result of the enhanced features provided by the combination of the aforementioned pillars. Then, Section 4 provides three representative application scenarios to illustrate the usefulness of the proposed scheme. Finally, Section 5 summarizes the ideas presented and discusses relevant implementation concerns and validation issues.

2. Conceptual Framework

Along the above lines, the proposed approach for more factual, evidence-based and accountable policy analysis and evaluation is grounded on the premise that ICT can actually help people make more informed decisions, rather than devolve into an instrument for misinformation and propaganda and aspires to take advantage of Europe's increasing amount of open public data to allow citizens to learn from historical experience by looking at how prosperity metrics have developed over time and how they correlate with political events or other political changes, as well as to collaboratively model and discuss theories explaining these changes. To this end, as already stated in Section 1, it comes up with a mixture of open public data and prosperity indices, FCMs, and argumentation technology and integrates the former with deliberation platforms and social media, so as to develop a comprehensive methodological framework and the corresponding tools, empowering citizens, especially the younger generation, and policy makers to better assess government policies.

In this respect, it envisages the construction of prosperity and other policy metrics through an easy to use language for defining variables and functions over open data sources, allowing citizens to define and implement their own metrics, based on their own sets of policy values, e.g. education, employment, environment, equality, freedom, health, justice, security, sustainability, etc. This fact implies the potential to search for relevant open data sources and allow existing metrics to be operationalized and implemented, to the extent that this is possible with the available open data sources, as well as the capability to define higher level metrics from lower level ones, using the visual language to compose and aggregate variables and functions.

Additionally, it foresees the construction of graphs and charts for visualizing metrics for selected geographical regions (e.g. cities, counties, lands and countries) and time periods, as well as the annotation of the latter with political and policy events, such as the election of a new government or the reduction of the tax rate. In this respect, the framework supports the capability to search for events by querying public open data sources, as well their appropriate visualization onto graphs and charts, enabling the user to trace back and verify the data sources utilized.

In parallel, it encompasses the construction of causal models through easy to use visual tools for designing FCMs and the simulation of their effects, but also the exploitation of argumentation technology for formulating pros and cons arguments in public debates about the relative merits of these causal models. In this sense, it involves apparently sharing and debating prosperity graphs and FCM causal models via widgets

for popular social media platforms (e.g. Facebook, Google+, Twitter, etc.) and visualizing debates in argument maps. Last but not least, it enables the conduction of structured surveys on policy issues, as well as the aggregation of opinions on related issues, so as to formulate a common position in a party or interest group.

3. Heading Key Pillars of the Approach

In the following sections, the main pillars of the proposed approach, namely prosperity indexes, open public data, fuzzy cognitive maps and argumentation technology are analyzed, focusing on the most important developments in each domain as well as on the advancements brought by the envisaged policy evaluation framework. Special mention is also made to deliberation platforms and social media, since they constitute a key factor for unfolding the full set of capabilities of the suggested approach.

Following the analysis of each individual pillar, Figure 1 reveals in a condensed and comprehensive way how these five pillars are combined in a pairwise fashion so as to realize the capabilities foreseen. In the resulting matrix, each of the elements of the diagonal reflects the contribution brought by each individual pillar, while each pair wise combination corresponds to a basic feature or use case scenario of the proposed approach, allowing for more complex use case scenarios to be built around the combination of lower level features, and thereby through the involvement of more pillars. Attention is also drawn to the fact that symmetric elements actually reflect different aspects of the same combination of pillars depending on which of the former is mainly in focus and which has a more auxiliary role with regard to the feature prescribed.

3.1. Pillar I: Prosperity Indexes

Prosperity metrics are used to capture the level of welfare and the quality of life in a given region or society [5], being thus suitable for the provision of advice to authorities regarding policies and projects, the specification of directives for industry and entrepreneurs, the use as input for assessing different aspects of economic activity by agencies and NGOs, as well as the provision of support for identifying the key factors that drive economic growth and development. Examples of prosperity metrics abound at city, regional or country levels, indicatively including the GDP², GPI³, ISEW⁴, GINI⁵, HDI⁶ and Legatum Prosperity⁷ indices as well as a number of indicators' concepts, related to positive externalities in labor force, the level of unemployment, the share of high-skilled labor force, infant mortality, the level of literacy, etc.

The Gross Domestic Product (GDP) per capita corresponds to the market value of all officially recognized final goods and services produced within a country in a given period of time, but has been heavily criticized as being inadequate, since it fails to capture the costs of production, such as pollution or depletion of natural resources. The Genuine Progress Index (GPI) on the other hand, is an alternative metric system which

² http://en.wikipedia.org/wiki/Gross_domestic_product

³ http://en.wikipedia.org/wiki/Genuine_progress_indicator

⁴ http://en.wikipedia.org/wiki/Index_of_Sustainable_Economic_Welfare

⁵ http://en.wikipedia.org/wiki/Gini_coefficient

⁶ http://en.wikipedia.org/wiki/Human_Development_Index

⁷ http://en.wikipedia.org/wiki/Legatum_Prosperty_Index

is an addition to the national system of accounts that has been suggested to replace, or supplement GDP as a metric of economic growth. GPI is used in green economics, sustainability and more inclusive types of economics. Another economic indicator, intended to replace GDP, is the Index of Sustainable Economic Welfare (ISEW), in the calculation of which consumer expenditure is balanced by such factors as income distribution and cost associated with pollution and other unsustainable costs. In a similar sense, the GINI Index is commonly used as a measure of inequality of income or wealth. The GINI coefficient by itself may lead to misconceptions regarding the actual differences of distribution of income if not analyzed in concordance with the underlying Lorenz Curves of cumulative income distribution.

Broadening the indicators' scope of application beyond the economic sector, alternative choices of prosperity metrics enumerate the Human Development Index (HDI), a composite statistic of life expectancy, education, and income indices to rank countries into four tiers of human development, as well as the Legatum Prosperity Index, an annual ranking of 142 countries, developed by the Legatum Institute, that is based on a variety of factors including wealth, economic growth, personal well-being, and quality of life. Another group of indicators of welfare are linked to subjective accounts of general level of wellbeing in a country mostly inspired by concepts such as health, and the rather non-mainstream field of happiness economics, captured in a number of already established indicators, such as the set of "Healthy life years statistics"⁸, produced by Eurostat for all the member states. Nevertheless, none of these alternative prosperity metrics has achieved wide acceptance, nor is there a case available, demonstrating that users are able to generate and calculate their own metrics in order to visualize the impact that certain policies could have on their own life.

In this context, and since there is no consensus about how to objectively measure prosperity or progress, the proposed approach offers users the choice of several popular prosperity indices, along with the possibility to construct and share custom prosperity metrics. More specifically, the suggested approach allows identifying appropriate sets of prosperity indices, related to specific policy domains and proposes guidelines for the development and evaluation of new, possibly composite progress indices which can be operationalized using individually chosen open data sources. Additionally, with the help of appropriate causal policy models it allows users to develop their own theories and impact assessment hypotheses about prosperity trend lines, while leveraging feedback from relevant discussions it enables to come up with appropriately weighted prosperity metrics that better reflect the citizens' sentiment.

3.2. Pillar II: Open Public Data

Calculation of the above-mentioned indices implies of course the examination of large data sets, ranging from census data to labor surveys. Large scale data sets nowadays tend to acquire their own self-contained existence rules, as they constitute independent sources of important technical, statistical or scientific information, definitely calling for further analysis and research. The importance of open, unrestricted access to huge data sets originating in research and the public sector has been advocated for more than a decade in both science and society [6].

In the context of the proposed framework, the need to define indicators of multifaceted nature and to produce new aspects of interest to citizens is to be addressed

⁸ http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Healthy_life_years_statistics

by making use of micro data to construct new sets of indicators. In the EU context the most promising source of micro data to capture such aspects is the Eurobarometer⁹, a series of surveys conducted in the member states through approximately 1000 face-to-face interviews per country. The Eurobarometer surveys may contribute in collecting information about which aspects of welfare are relevant to citizens and thereby in addressing these in policy actions. An additional source of information is Eurostat¹⁰, the statistical office of the EU and a leading provider of high quality statistics that enable comparisons between countries and regions. The most important and reliable open data sources in the indicator context provided by Eurostat are the European Union Statistics on Income and Living Conditions (EU-SILC)¹¹ and the Urban Audit¹², the European cities Eurostat.

The envisaged approach will leverage the above mentioned as well as other sources of open public data and will make use of widely accepted metadata specifications and open data platform software to enable their harmonization and consistent exchange. As a result, beside the collection and storing of data from official sources, it will also give users the opportunity to collect, store or even publish themselves metadata for the open data sets of their choice, offering thereby a wide range of capabilities for creating own mash-ups and visualizations of metrics and historical events and validating policy causal models based on actual data sets, currently not possible in other deliberation or open data platforms.

3.3. Pillar III: Fuzzy Cognitive Maps

Policy impacts models are to be defined within the context of the proposed approach on the basis of fuzzy cognitive maps (FCMs). FCMs provide a well-founded, general-purpose and intuitive method, based on fuzzy logic, for modeling and simulating relationships between variables and have been widely used to model and simulate policies and their effects.

Cognitive maps (CMs) were first introduced by Axelrod [7] to represent social scientific knowledge. A CM is a network diagram depicting causes and effects and as such it is represented by a labeled, directed graph of nodes and edges [8]. Nodes represent domain concepts and edges causal relationships between nodes. The direction of an edge represents the direction of the causal relationship, which is also called a feedback. A feedback is positive (negative) if an increase in the first variable leads to an increase (decrease) in the second variable. In order to enlarge the scope of CM applications, several variations of CMs have been introduced in the literature. A fuzzified version of the CM was first introduced by Kosko [9]. The FCM incorporates fuzzy causality measures in the original cognitive maps, so as to provide a flexible and more realistic representation scheme for modeling theories.

The proposed approach leverages the causal characteristics of FCMs to model the theoretical assumptions underlying public policy proposals, and thereby to enable through an easy to use, graphical user interface a broad range of stakeholders with limited technical expertise, to develop and apply their own causal policy models. Accordingly, it combines FCMs with flexible, mashable visualizations of prosperity indexes, so as to empower users with the capability to develop ideas about the causes

⁹ Standard Eurobarometer 78, http://ec.europa.eu/public_opinion/archives/eb/eb78/eb78_en.htm

¹⁰ <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>

¹¹ http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/eu_silc

¹² http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/city_urban/urban_audit_data_collections

of correlations among historical events and prosperity fluctuations. Furthermore, it enables users to collectively define policy impact models and simulate the impacts of policy changes, as well as use them to get involved in fruitful debates, attaching a collaborative character to policy analysis and monitoring processes, but also filtering and validating the identified models, and thus the strength of the correlations involved.

3.4. Pillar IV: Argumentation Technology

Argumentation Technology, and thereby argumentation support systems are computer software for helping people participate in various kinds of goal-directed dialogues in which arguments are exchanged. Their potential relevance to e-Participation is readily apparent, since the former refers to the process of engaging citizens in dialogues with government about such matters as public policy, plans, or legislation, in which argumentation surely plays a central role. The idea of using argumentation support systems for e-Participation is not entirely new. Arguably it can be traced back at least to Horst Rittel's pioneering work in the early 1970s on Issue-Based Information Systems [10], which are essentially visual maps of arguments, to help people collaborate and find solutions to what he called wicked problems, i.e. problems which have no algorithmic, scientific or objectively optimal solutions for a variety of reasons, including the lack of consensus among stakeholders about such things as utilities and values.

Typically, e-Participation projects make use of generic groupware systems, such as discussion forums and online surveys, not providing however specific technical support for argumentation, and thereby for enabling citizens to obtain a quick overview of the issues which have been raised, to list ideas which may have been proposed for resolving such issues, to see in one place the arguments pro and con these proposals, or to get an idea about which positions currently have the best support, given the arguments put forward thus far in the dialogue.

Argumentation contributes in making the decision and policy making process more efficient, transparent, open, fair and rational. Thereby, argumentation technology is employed within the context of the proposed approach for critically discussing prosperity indices and causal models underlying policies. Additionally, the use of argumentation is foreseen for summarizing and visualizing the debates in argument maps, polling public opinion on policy issues in the context of e-Participation platforms, and aggregating poll outcomes to formulate a common position in a party or interest group using delegated voting.

3.5. Pillar V: Deliberation Platforms and Social Media

Deliberation platforms incarnate the result of the effort taken by Government agencies, to increase citizens' engagement in their decision and policy making processes. The first wave of deliberation platforms has witnessed extensive information on government activities, decisions, plans and policies, the proliferation of e-voting and e-consultation spaces, along with various types of e-fora. Not surprisingly, the first generation of deliberation platforms did not meet the original expectations. The advent of Web 2.0 tools has created a more vivid environment and the popularity of the social media has set a new battlefield for the concept of e-Participation. Given that citizens' engagement in policy making is an important facet of e-Participation, an outstanding feature of the envisaged approach is the integration of the proposed solution concept

into existing deliberation platforms and social networks. Such a perspective is anticipated to complement current e-Participation approaches with tools for simulating and evaluating policy theories or models, and assessing policies on the basis of progress indicators, as well as to enhance citizens’ participation as a result of the capability to collaboratively develop or share customized policy models and prosperity indices and thereby to obtain the citizens’ perspective on policy issues.

	Pillar I: Prosperity Indexes	Pillar II: Open Public Data	Pillar III: Fuzzy Cognitive Maps	Pillar IV: Argumentation	Pillar V: Deliberation Platforms & Social Media
Pillar I: Prosperity Indexes	Define higher level metrics from lower level ones	Construct metrics by operationalizin g open data sources	Predict the evolution of prosperity indicators by applying causal policy models	Weigh prosperity aspects according to the opinions expressed	Define prosperity metrics collectively
Pillar II: Open Public Data	Use historical events to annotate metric visualizations	Access open data sources, Publish data sets & their metadata	Use historical data to validate causal policy models		
Pillar III: Fuzzy Cognitive Maps	Develop ideas on the correlations among policies and prosperity fluctuations	Simulate causal policy models based on open data sets	Develop and apply own causal policy models	Define the strength of correlations according to the opinions expressed	Define policy impact models collectively
Pillar IV: Argumentation	Debate on prosperity metrics		Debate on causal models underlying policies	Summarize and visualize debates in argument maps	Aggregate poll outcomes to formulate a common position
Pillar V: Deliberation Platforms & Social Media	Share own developed prosperity metrics		Share own developed causal policy models	Poll public opinion on policy issues	Ensure citizens’ wide participation

Figure 1. Key connection points among the pillars of the proposed approach

4. Application Scenarios

This section presents a series of representative scenarios to illustrate the applicability of the proposed approach in the policy analysis and evaluation phases of the policy cycle. Apparently, the first scenario is mainly addressed to the general public, while the second one engages lay users and experts as well. The third scenario corresponds to a horizontal dimension of the proposed approach and complements the other two in a bidirectional way.

Policy Monitoring and Evaluation Scenario: Motivated by their desire to check or verify whether a specific policy action, policy directive, law etc. has actually achieved or failed to meet the initially set goals, and thereby whether the relevant or accompanying KPIs have actually reached or not the target values promised, citizens

may leverage the proposed approach to confirm the understanding they have. Searching for and taking advantage of relevant metrics and open data sets is the first logical step, while exploiting existing causal policy models to verify their assumptions in a more documented way is an enhanced option. At the same time, drawing connections between metrics and specific policy actions and generating suitable visualizations, enhances the reasoning process and allows reaching more informed judgments on policy making. Finally, sharing the findings with a wider community is also supported.

Policy Analysis Scenario: Relevant to the former scenario, a user that is more involved in the policy making process, i.e. an expert, a policy maker etc., may not be satisfied with simply utilizing existing casual policy models to verify or even analyze and predict policy outcomes. A user with the relevant background can thus build a new (or ameliorate an existing) casual model. Turning the former in a more user friendly and comprehensible form, i.e. a Fuzzy Cognitive Map, can act as a catalyst for understanding and evaluating the newly developed model. Running simulation through the aforementioned model, in order to predict future impacts, is an additional advanced option. Accordingly, sharing outputs with other users is foreseen as well.

Online Deliberation and Argument Mapping Scenario: Online deliberation can act as a catalyst both a priori and a posteriori of the two previous scenarios: Online discussions can on the one side offer valuable input to anyone looking for data and information relevant to his/her interests, before actually taking advantage of the envisaged approach for policy analysis and evaluation in the ways described within the aforementioned scenarios, while on the other side, users can be engaged in multilateral meaningful discussions for reasoning on, criticizing and verifying policy analysis and evaluation results. Additionally, and since non-structured deliberation is not always of actual value, argument mapping offers an easy and effective way to quickly navigate through discussions and extract relevant conclusions that can provide input and feedback for the scenarios described above.

5. Discussion and Conclusions

This paper presented a framework for improving the quality and transparency of the policy making process, by complementing current e-participation practices with innovative tools for simulating and evaluating theories and models underlying policies. The proposed approach reflects the methodological framework, developed within the context of the Policy Compass FP7 project for making better use of Europe's open public data resources and empowering policy-makers and citizens (especially the younger generation) to better assess government policies in the policy analysis and monitoring phases of the policy cycle, and is intended to be realized as an online web platform, integrating a number of service components that will offer the capabilities and functionalities prescribed. Important success parameters in this respect include exogenous factors, such as the actuality, completeness and geographical coverage of the indicators to be made accessible through the platform, as well as implementation concerns, such as data consistency, harmonization and exchange issues, which impose the development and adoption of a comprehensive metadata management framework.

The Policy Compass approach is anticipated to raise and objectify the public discourse on how to measure growth in the economy and society and accordingly facilitate the exploration of the opportunities and limits of growth, resource consumption and technological progress, to enable decision makers to make their

achievements more explicit to the public, and thus increase the former's confidence in progress towards societal goals as well as its monitoring and controlling power over potential or applied policies, and to allow citizens to obtain a clearer view of the multiple dimensions that underlie policies, including their unintended side-effects, as well as to improve the objectivity and evidential basis of their arguments so as to enhance the quality of policy deliberations.

The envisaged methodological framework is to be further detailed and refined along the course of the project. Assessment and validation of the latter is foreseen through the development and application of real case pilot scenarios for policy analysis and evaluation at both regional and local level.

Acknowledgments. The research leading to these results has been supported by the EC FP7 under the project "Policy Compass" Grant Agreement 612133.

References

- [1] A.G. Wilhelm, *Democracy in the Digital Age: Challenges to Political Life in Cyberspace*, Routledge, New York, NY, 2000.
- [2] M.E. Milakovich, The Internet and Increased Citizen Participation in Government, *eJournal of eDemocracy (JEDEM)* 2(1) (2010), 01-09.
- [3] H. Jafarkarimi, A.T.H. Sim, R. Saadatdoost, J.M. Hee, *International Journal of Emerging Technology and Advanced Engineering*, January 2014.
- [4] F. Mureddu, D. Osimo, G.S. Misuraca, S. Armenia, A New Roadmap for Next-Generation Policy-Making, *Proceedings of the 6th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2012)*, 62-66, ACM, New York, 2012.
- [5] E. Diener, S. Eunkook, Measuring Quality Of Life: Economic, Social, and Subjective Indicators, *Social Indicators Research* 40 (1997), 189-216.
- [6] K. Granickas, Understanding the Impact of Releasing and Re-using Open Government Data. Topic Report No. 2013 / 08, European Public Sector Information Platform, 2013.
- [7] R. Axelrod, *Structure of Decision - The Cognitive Maps of Political Elites*, Princeton University Press, Princeton, NJ, 1976.
- [8] M. Bryson, F. Ackermann, C. Finn, *Visible Thinking: Unlocking causal mapping for practical business results*, John Wiley & Sons Ltd, 2004.
- [9] B. Kosko, Fuzzy Cognitive Maps, *Int. J. Man-Machine Studies* 24 (1986), 65-75.
- [10] H.W.J. Rittel, M.M. Webber, Dilemmas in a General Theory of Planning, *Policy Science* 4 (1973), 155-169.

Private Financing of Road Taxation

Wouter F. VAN HAAFTEN¹ and Tom M. VAN ENGERS

Leibniz Center for Law, University of Amsterdam

Abstract. In the past few decades several developments have lead to a new view on the division of roles between the public and the private sectors when performing public tasks. Developments like the application of information technology on a large scale combined with the notions of new public management increased the involvement of the private sector in public service. Now it seems that the private sector is being granted a prominent role in one of the most public of public tasks, taxation, in particular free flow, GPS based, electronic road user tax. Next to various technical challenges this leads to new questions like how to get the levying of a tax financed by a private company. It appears that many factors play a role in the way the various actors, public authorities, toll charging companies and financiers behave in this type of Public Private Partnership process. This particular type of charging, using an on-board-unit in the vehicle requires large investments in electronic equipment at the start of a project.

In this paper the arguments and considerations of the parties involved are being analysed. The unorthodox approach is not a technical one, focussing on systems and public administrative processes, how interesting they may be, but one that looks at the entire phenomenon of outsourcing a task so public as taxation to the private sector. The question is whether public electronic road user charges, levied as a tax, can be 'designed, build, financed, maintained and operated' as a PPP. In particular the focus of the analysis will be on the financing of the electronic road user tax. What are the issues when privately financing public electronic road user tax? In this paper the issues are being inventoried from different angles. The conclusion on how to establish the private financing of a public electronic road user charge is still evolving and it is too early to draw final conclusions on this research in this contribution.

Keywords. E-government, good governance, road user charges, road taxation, tolling systems, public private partnership, public private financing

Introduction

Since the 1990's two major developments have occurred within government and administration. The first and mostly technological driven development was the emergence of the e-government. Especially for administrations processing large amounts of data like taxation and social security, and registration processes like the registration of cars and buildings, information technology became essential for public service delivery.

Another development from that same period was the retreating government. The new public management idea was that the market was better equipped for delivering

¹ Corresponding Author. Can be reached at vanHaaften@uva.nl.

service to the citizen, now called customer. More and more of the classic public tasks originally performed by the public bureaucracy were outsourced to private parties. And because the tasks themselves did not become private and the responsibility for the public tasks was still a political one, new checks and balances had to be found. Outsourcing of public tasks seemed to be a way of getting the best of both worlds in those cases where a full transfer of the service to the private sector was not desirable.

This movement towards more private involvement in the public domain also threw a new light on a long existing phenomenon on the public/private interface: The Public Private Partnership (PPP). This type of cooperation between the public sector and private companies was mainly known from large infrastructural projects like roads, bridges and tunnels. In those cases the infrastructure was designed, build, financed, maintained and operated (DBFMO) by the private (consortium of) company(ies) involved. In return on there investment they gained the right to charge a toll for the use of that particular infrastructure. Many examples of tis type of PPP tolling are known all over the world.

The three above mentioned phenomena nowadays seem to come together in a relatively new public activity that requires high investments in a complex hi-tech infrastructure accompanied by substantial risks and liabilities The Electronic Road User Kilometre Tax.

Electronic Road User Kilometre Tax

Since the turn of the century a few major influences have propelled the ideas on how to collect tax from vehicles. The classic car taxes, purchase tax, road tax and fuel excise were considered to be not specific enough for the desired subject of taxation, the use of the car. Except for the excise duty the taxation did and still does not seize to the actual use of the vehicle. Therefore these taxes were less suitable for contributing to the solution of two emerging political issues: road congestion and CO₂ and particle matter emission. A good political selling point was that it would be fairer to charge people for the use of the car rather than for owning it.

From the technical side the development of new information technology, in particular the breakthrough of GPS, enables a levying process based on kilometres driven, specified in place and time. Also the huge amount of data that needs handling in such a process has become more feasible in the past decade, due to technological developments and gained experience in handling these processes. Electronic road user kilometre charge is an e-Government development that could change the collection of vehicle tax permanently and that could enable more refined charging from vehicle users in the future. In this respect the electronic (free flow) road user kilometre tax is to be distinguished from a conventional method like collecting toll on the road by a concessionaire toll charger. This modality will require a much lower investment in the tolling operation and will have a limited financial risk. A free flow electronic road user kilometre charge brings about a large investment. At a price of 125 euros per on-board-unit and a system requiring 0.4 to 1 million devices will cost 50 to over 100 million² euros in advance. As we will stipulate later this investment in a political environment contains a high risk.

²Figures derived from the 2014 Belgian tender for an electronic road user kilometer tax for heavy goods vehicles.

Private Financing of Electronic Road User Charge

Private financing of public charging may seem not very disruptive, but it is by far not a standing practice. One of the main issues is that the two sectors, public and private, have a legal realm of their own. The private realm is being ruled by the civil law including its fundament of equality of legal subjects. The public realm however is being ruled by public law where the inequality of both subjects, state and citizen, is fundamental. Combining the two becomes a true challenge when concerning a task so ultimately public as taxation.

In western European democracies it is generally accepted that public charges, must be based on a decision from the Parliament. That is the only way to get a majority basis for the acceptance necessary for actually collecting the money.

Road user charges on conceded roads could be considered as a payment for a service. In that case the money will go to the concessionaire company to finance their DBFMO activities. In return the company maintains and operates the road, and makes it available to the user. If road user charges are a tax however, there is no relation between the money paid for the use of the road and the destination of the revenues. This means that the tax revenues will be added to the treasury, and will also be available for other public spending. The decision on how to spend these revenues therefore is a political one.

Running Electronic User Charge as a Tax

On non-conceded roads the instrument of taxation is often used as the basis for the public levying, for multiple reasons. The first one is that the legal infrastructure for the levying of taxes in general is already in place. Usually there is a Tax Administration attributed with sufficient powers necessary to ensure a proper levying of taxes. Public toll chargers can also be enabled with at least some of these powers. Another reason is that a tax creates certainty for both state and citizen. A law has the proper status and is subject to democratic control, which means that for instance tariffs cannot be raised overnight. Therefore when road user charges apply on public roads, the tax framework will often be the starting point.³

It is however possible to levy an electronic road user charge on public roads without shaping it as a tax. The German scheme⁴ as foreseen in 2003 had the shape of a kilometre charge 'comme suis'. It was entirely managed by the German Ministry of Transport and Housing, while a private consortium⁵ provided the service. In this approach the Ministry of Finance (and taxation) was playing only a minor part, and the available tax framework was not used. It is possible that the lack of expertise in the field of collecting public revenues may have contributed to the problems that arose around the start of the operation.⁶ In most other countries however, certainly when the Ministry of Finance is involved in one way or the other, the road user charges is most likely to be shaped and conducted as a tax.

³The Benelux, Denmark and Sweden all have shaped the Eurovignette as a Tax, as France did with its Eco-tax.

⁴An on-board-unit based KM charge For heavy goods vehicles (>12 tons).

⁵Tollcollect, a company established for this special purpose by Daimler and Deutsche telecom.

⁶The start was delayed for 15 months due to technical problems at the start up.

Next to the levying of taxes itself, financing of this operation traditionally is a public-state-affair. Financing in it self has never been much of an issue since the state has all the means to collect the tax money and is capable of doing so in a very economical way. For instance in 1992 the costs for levying all taxes in the Netherlands were 2.7% of the acquired revenues. In 2012 the costs had run up to 3%, but that seemed to be more due to a lower income level than to higher perception⁷ costs. So the amount is relatively stable at a modest level.⁸ Looking at the electronic road user kilometre taxes that are on the road today a figure of 5% perception costs does seem too low. Even the 10% that is being aimed at in the PPP based Belgian tender could appear to be a rather optimistic estimate.

Public DBFMO for Public Road User Charges

It is only fair to state that a Tax Administration will not easily take on electronic kilometre charging as a viable way of collecting tax money. As shown it is a rather uneconomical way to collect taxes. Kilometre charging however often carries more goals than only collecting revenues. Goals like covering the internal costs of road-use, charging for using the vehicle during rush hour in order to reduce congestion and the reduction of the emission of CO₂ and particulate matter can be well served by the introduction of an electronic road user kilometre charge. When the public authorities are not very eager to take on the execution of kilometre charging within their own realm, a step to a private service provider seems logical, even if it will jeopardize the 3% track record on perception costs.

So what are the pros and cons for the public authorities to perform a road user charges as a tax their selves?

Pro

Full control
Public financing, low interest rates
Full use of the tax instruments
Economies of scale
Financial risks limited

Con

Political risk
Claim on budget
Pre financing on national debt
Perception costs not 100% transparent

The advantages of having the administration running the road user charges itself are mostly of a rational economical nature. Performing the road user charges gives the administration full control over all the aspects of the operation. On top the administration can use all the general instruments on collecting and enforcement of taxes, without having to connect these processes to an external party. Being part of a far larger tax collecting scheme and a large organisation also emerges economics of scale. Financially a 'do it yourself' scenario will cost less due to lower interest rates and also the financial risks will be less complicating because the risk is born where it initially belongs; within the public domain.

⁷ Perception costs are all costs that have to be spent to collect a tax in the public setting. In private terms: Design, Build, Finance, Maintain and Operate.

⁸ In 2002 at the end of the first Global Positioning System based KMH project in the Netherlands one of the opponents of KMH in Parliament made sure that a legal condition for introducing the km charge was set at a maximum cost of 5% of the revenue per annum. That was regardless of the fact if it was set up as a full public operation, or as a PPP.

The contra side of the sheet however shows clearly why politicians have a preference for a PPP construction in case of an electronic road user charge, even on public roads. Financial risks may be lower within the public domain, but the political risks are high for a minister directly responsible for the levying administration. Furthermore public money may be cheaper, it also happens to be scarce and the inevitable investments in systems and on-board-units (OBU's) will, in this case, be put on the public balance sheet.

Private Partners in Public Tasks

So the question is; can road user charges as a tax be carried out as a PPP? And if yes, in what way can a PPP be shaped financially in case of an electronic public road user charge?

There are many ways to create a PPP. In fact even in a full public operation like levying tax by the Tax Administration private partners will play a certain -limited- role.

The declaration form is delivered by mail and the money transfers are taken care of by the banks. Very loose partnerships with modest consequences for the financial positions of both sides, but nevertheless a role for the private sector in handling taxation.

A bigger role is being played when the public service outsources its computer centre to a private party. A complex juridical relation between public and private is born. Risks remain mostly at the public side, although the public standard conditions for contracting try to limit public liability by transferring the risks to the private partner. The IT-company however will calculate these risks as costs and transfer them into financial claims as much as possible.

Closer to our road user charges scheme is the situation where the public service outsources the building of a tunnel or a bridge to a private consortium. The private party is contractually coupled to the public domain and could for instance have obligations towards the public customer laid down in a contract. In this case risks seem to be manageable within the private sector and financing the project will be possible on the basis of building assets. While money is being spent from one side of the balance sheet, on the other side the assets -tunnel or bridge- grow more or less accordingly. In the latter two examples the financial risks are being directly transferred to the private (financial) sector.

Private Partners in Electronic Public Road User Charges

So what then are the benefits of a DBFMO contract for electronic road user charges for private companies? From an economical point of view a good DBFMO contract for road user charges can provide profitable business. Moreover it can provide this business for a long term (>10 years). For a road user charges company or consortium also the maintenance of skills and credibility are an important issue as they relate to the continuation of the company. Finally the public domain remains a creditworthy partner, even in -or maybe especially in- times of economic crisis.

Private Finance when Building Infrastructure in Two Phases

Despite these benefits the financial risks for the private sector remain substantial. In order to manage them they should be split in two phases, each with a dynamic and a risk structure of its own.

The first phase is the project phase. The project phase requires project financing. That means money will go in, but revenues will not come out yet. In this phase financiers will require certainties for their investment. A mortgage right on the build assets, or a transfer of future revenues for instance. These measures make the risks much more calculable and assessable and, more or less, maximized to the investment itself. Both private equity and bank loans could provide for the necessary investments in this case. A very important issue in the investment decision will be the historical context. Bridges and tunnels have been built for a long time and the expertise on these activities is widely spread. Moreover a guarantee on the number of traffic that will eventually use the tunnel or bridge may help to close the business case. These measures will reduce risks and will make it easier for financiers to step in.

The second phase is the going concern phase. In this phase financing becomes less exciting. Revenues start coming in from users and the going concern financing can even be arranged for within the operating company itself. If that is not possible parties interested in long-term steady income, like institutional investors, may be interested. Private equity and banks⁹ usually have a more short-term horizon and are not likely to step or stay in at the going concern phase.

Private Finance for Electronic Public Road User Charges

How does private financing work out in case of electronic public road user charges? The first step to be taken by the public service is inviting the market to deliver a tax collection system on a DBFMO basis. This means the beginning of a complex juridical relation where risks, including the financing risk, tend to move from the public to the private sector. When proceeding on the path of PPP in taxation a few general issues can be distinguished for the public as well as for the private side, and in some cases for both sides.

Starting with the latter, one of the issues that come up when private companies take on public tasks is the different social, economical and legal context that applies to public tasks compared to their private ones. Within their private paradigm, the impact of public tasks is not day-to-day business. The politically driven public domain has a different paradigm implicating a set of rules that substantially deviates from the market place, where a financial plus at the end of the day is the main driver. The public/private interface must be developed for and by both the private service provider and the public customer. Since both come from very different worlds in practice managing the interface often appears not to be easy. Furthermore it is almost impossible for a private company or consortium to guarantee the loss of public revenue in case of system failure due to the unbalanced relation between the amounts of revenue and the financial basis of the company or the consortium. The German case shows that a situation like that can well end in a legal and financial deadlock.¹⁰

⁹ Banks have to compensate for long term loans on their balance sheet according to Basel 3 rules.

¹⁰ The 15 months delay at the start of the German system has ended in a billions of euros claim of the German State on the service provider that still has not been settled.

Let's put the pros and cons in balance:

Pro

High interest rate
Strategic considerations
Idealistic motives

Con

No short term revenue
High investment, dedicated system and on-board units
Subject to political turmoil

So the Design and Build project seems to be not very attractive to potential private finance-partners. This means the profit must be in the Maintain and Operate part. The interest in the investment in the project should be coming from the expected -potential- remunerations in the operation phase. In fact this phase does not stand out that much from financing a private road user charges operation as described in the former paragraph.

Project Phase

The first question on financing the project phase of a public road user charges could be: why would anyone invest in a road user charges project? Building up a GPS based road user charges system costs a lot; a back-office system with customer relations and financial handling, an enforcement system and last but not least OBU's for all road users. As we saw the investment in on-board-units may well go up to 50 or even up to 100 million euros. On the other side of the balance sheet however appear no revenues (yet) and also no real estate assets, like in the case of building roads, tunnels or bridges. The on-board-units however must be depreciated immediately if for one reason or the other the project is being cancelled. Also the fact that the public customer will have no in depth expertise on road user charging at the first start will not help to achieve a business case for financing road user charging privately. A final blow for the financier's appetite in the project phase could easily be the political uncertainty whether the system will come into operation at all, or whether it will be abolished after the next (advanced) elections.¹¹ The interest rate and risk premiums must be very high to even consider financing such an operation.

When the end of the project approaches another big issue for the private company will be the start up risk. This risk should be considered a project phase risk, since the operation can only be started after the customer has accepted the project results. The complexity of a road user charges scheme implicates that, even if all processes are generally well controlled, the chances of failure of (parts of) the system at the start up remain substantial.¹² It is obvious that all the main issues mentioned above could have a serious impact on the extent to which the public road user charges can be financed.

So far we have extensively looked at the financing of the electronic road user charges. The barriers that have to be overcome in this field can be considered an issue both for the private as for the public side. For private investors because of the high risk

¹¹ Interesting is the example of the French Ecotaxe where all investments have been made, but the actual tax has not been implemented (yet) due to political turmoil. This is a worse case scenario for the private investor.

¹² Most of the road user charging schemes have serious problems and loss of revenue during the first 6 months of their operation. Eurovignette 1994, German Maut 2003, French Ecotaxe 2013, and the various schemes in the Mid European Countries that had to change their contracts and laws during the start up phase, sometimes even more than once.

of losing money due to the absence of collateral, and for the public side because of the risk of not being able to find a consortium that is willing and able to meet the financial requirements.

Going Concern Phase

The various issues on private financing of the road user charges can be divided in project financing issues and going concern-financing issues. The two stages of the DBFMO-agreement do not have the same financial dynamics. Obviously the project phase is by far the most complex one where the above-mentioned issues playing a large and sometimes even prohibitive role. It is the phase of investing and developing.

All the factors will have to be compensated for in the remuneration for the investor in the going concern phase, either a bank providing a loan or an investor providing private equity. This can lead to substantial costs for the customer since the uncertainties will be calculated in the eventual service fee. This is the harvesting phase. The better the project phase was conducted and the smoother the system has been introduced, the lower the investment can have been.

In the going concern phase itself financing becomes less of a problem. A regular income will be gained from the agreement with the customer for a long period of time, usually more than ten years. Although there is always a risk of system failure, that risk is hardly comparable with the risks in the project and start up phase. It should be possible to avoid, or at least minimize losses on revenues and fines, provided that the operating company meets the high standards that are imposed by the customer.

Financing Public Electronic Road User Charges – A Stakeholder View

Now summing up the arguments pro and contra a PPP in case of a public electronic road user charges one can clearly distinguish the three (groups of) players. The public authorities are operating within their own financial realm with its specific public finance rules and implications. The DBFMO contractor will be mainly interested in doing the job. And the financial partners will be seeking return on their investment.

Public Authority

A major concern for the public authorities is to avoid investments in a road user charges system to appear on their balance sheet. In that case they will affect the state debt and that does not seem acceptable these days. This is an important incentive for leaving the investments to the private partners. Reduction of political risks is another important advantage of outsourcing, both operational and financial. In this way the political responsibility for a possible loss of tax revenue and the complex operation with a lot of potential pitfalls are being put at a distance from the authorities, thus providing a buffer to the direct political risks.

The downside for the public authorities is probably more felt at the administration level than at political level. These include higher costs for financing the system, the risk of becoming too much dependant on a contracted service provider, and the fact that little road user charges skills will be built up within the Tax Administration itself.

DBFMO Contractor

For the DBFMO contractor the advantages are more on the long run. The public authorities will be a credit worthy customer in most countries. The contract that will be concluded will provide long term revenue and continuity (>10 years) and the operator holds and even increases its expertise, necessary for the continuity after the contract has ended.

On the other hand the high financial risks are a serious downside to the public taxed road user charges as is the complexity of the system due to public rules and standards.

Financer

From the financer' point of view a distinction should be made between the project phase and then going concern phase.

In the project phase the financer will go for the high-risk premium and high rates. However this could appear not to be enough to attract private capital. In that case the public authority could consider granting a public guarantee for at least a part of the investment, in order to provide for a solid business case. For private equity particularly a profitable sale after surviving the start of the system will be preferred. For the banks high margins on loans during the project phase could be interesting.

In the going concern phase the most apparent advantage is the long-term stable income that will come out of the operation. For private equity the lack of expertise on the subject on their side and the political uncertainty could prove to be showstoppers. They will probably sell the project after start up. Also banks do not care too much for long time loans because of the internal consequences due to Basel 3 rules and the absence of collateral like real estate. More likely it seems that the operating company itself will do the financing. Also Institutional Investors¹³ could be interested, although to them next to the lack of expertise as well as the (relatively small) size of the company could appear problematic.

Conclusion

How to deal with the outsourcing of levying public electronic road user charges or taxes? In this paper we have put the issues in perspective for further study. From different angles we looked at the phenomenon, leaving the technical and the public administrative processes aside. We focussed on the legal and financial issues that evolve from this type of public private partnership. Under which circumstances can private DBFMO, and particularly private financing of a public electronic road user kilometre charge work?

When it comes to private financing of public electronic kilometre charge it seems that a balance between risks and gain for the two parties cannot easily be found. More case studies and research may lead to better understanding of the way the political demands on the one side and the plain market mechanisms on the other sides should be matched.

¹³ Like equity and pension funds.

Literature

- Tanja A. Börzel, Yasemin Pamuk, Andreas Stahn, *Good governance in the European Union*, Berlin, January 2008.
- Brian Z. Tamanaha, *On the rule of law, History, Politics, Theory*, Cambridge University Press, 2004.
- Andrew T.W. Pickford, Philip T. Blythe, *Road user charging and electronic toll collection*, Artech House ITS series, ISBN 1-58053-858-4.
- José Viegas, *Tolling Heavy Goods Vehicles on European Roads. From a Diverse Set of Solutions to Interoperability?* CESUR – Instituto Superior Técnico; and TIS.pt, Transportes, Inovação e Sistemas, s.a. Lisbon, Portugal, EJTIR, 2003.
- Alan C. McKinnon, *A review of European truck tolling schemes and assessment of their possible impact on logistics systems*, Logistics Research Centre, Heriot-Watt University, Edinburgh, 2011.
- Robin Lindsey, *Reforming road user charges: a research challenge for regional science*, Department of Economics, University of Alberta, Edmonton, Alberta, Canada, T6G.
- Philip T. Blythe, 1. *Electronics in transportation*. 2. *Motor vehicles – Automatic location systems*. 3. *Tolls*.
- David M. Newbery, Georgina Santos, *Road Taxes, Road User Charges and Earmarking*, © Institute for Fiscal Studies, 1999.
- David M. Newbery*, *Road User and Congestion Charges*, University of Cambridge, Cnossen/Theory and Practice of Excise Taxation, 2004.

Services

This page intentionally left blank

The impact of digitization on the management of administrative procedures: The case of building permits

Georgia KOURAKOU^{a,1} Olivier GLASSEY^a and Florian EVEQUOZ^b

^a *Swiss Graduate School of Public Administration (IDHEAP), University of Lausanne, Quartier Mouline UNIL, CH-1015 Lausanne*
{[georgia.kourakou](mailto:georgia.kourakou@unil.ch), olivier.glassey.1@unil.ch}

^b *University of Applied Sciences Western Switzerland (HES-SO), Sierre, Switzerland*
florian.evequoz@hevs.ch

Abstract. Information and Communication Technologies provide public administrations new ways to meet their users' needs. At the same time, e-Government practices support the public sector in improving the quality of service provision and of its internal operations. In this paper we discuss the impacts of digitization on the management of administrative procedures. The theoretical framework and the research model that we will use in this study help us tackle the question of how digitization transforms administrative procedures as, for example, in terms of time and roles. The multiplicity of institutions involved in issuing building permits led us to consider this administrative procedure as a very interesting case study. An online survey was first addressed to Swiss civil servants to explore the field, and here we present some of its results. We are currently undertaking an in-depth case study of the building permit procedures in three Swiss Cantons, which we will also present in this paper. We will conclude with a discussion and the future steps of this project.

Keywords. Digitization, e-Government impact, administrative procedures, time, changing roles

Introduction

E-Government has become a key policy area that can improve competitiveness. Many public administrations, following trends from the private sector, are making efforts to benefit from the great potential of new technologies, providing a wide range of information and services. The main objective is for the government to be more efficient and effective in interacting with its users and in its internal operations as well. Electronically available public services, are considered essential [1] because they have better quality, are more responsive, are more efficient, and are more consistent with their users' needs.

Regarding the growth of e-Government projects, K. Layne and J. Lee developed a four-stage model [2]. We will focus on the two first stages, which are more in line with

¹ Corresponding Author.

the needs of our study. Indeed, the first stage includes the cataloguing of information online, and the second, the transactions being completed online. Stage one constitutes the early steps of administration, assuring an online presence by presenting its activities and the relevant information online. In stage two, administrations provide full access for electronic transactions and online databases for services, such as paying taxes, fees, etc.

This second stage covers the idea of “one-stop service,” where the users contacting one domain of government can carry out any level of government transaction [3]. Users usually need to contact several different public departments to solve a single problem. The idea of “one-stop shopping,” based on the idea of the 1980s’ “one-stop service centre,” offers an integrated service of one provider, coordinating more departments with the help of information technologies [4].

The public sector, in order to satisfy its users, tries to face the complicated and time-consuming nature of administrative procedures by increasing their efficiency and by reducing the administrative burden and the delays in all administrative procedures. We have to underline that e-Government policies and projects may have an impact on the economy, on the society, and on the government. This impact is the result of a combination of several actions, the last step in a process that can have positive or negative effects [5].

Under a management perspective, it is very important to know if the methods used are appropriate and if it is necessary to control the results. According to R. Heeks, the measurement of outputs and impacts requires some form of investigation [6]. For this reason, several surveys have been conducted so far, concentrated mainly on the adoption and the use of e-Government, but less on its impacts.

In our literature review, we could not find relevant and concrete examples of how the success of e-Government can be measured. R. M. Peters, M. Janssen, and T. M. Van Engers suggested that we should take into consideration that e-Government involves many aspects of public administration, making the issues more complicated [7]. Additionally, the Organisation for Economic Co-operation and Development (OECD) indicates that even if there are many international comparisons of the impacts of e-Government, there are few international standards or indicators that leaders can use to facilitate decision-making. Finally, this makes the effort to share the best policy practices between countries difficult and shows that certainly there is still plenty of room for improvement and examination.

1. Research Methodology & Data Analysis

Our research aims at deepening our understanding of the impacts of Information and Communication Technologies (ICT) in public administration. The principal actors in this study are public administrations themselves, as well as users of public services (i.e., citizens and businesses). The internal operations of public administrations are the focus of our study.

In order to study these internal operations, we will investigate changes and transformations resulting from the implementation of e-Government practices. While the literature review brought us limited reference with regard to these issues, we selected what we found to be the most relevant dimensions and criteria for measuring the digitization of administrative services. These include administrative tasks, time,

roles, and services offered to the users. We will explore these four dimensions in different ways, as well as combining them together.

Furthermore, the research detailed in this paper was driven by a set of key questions. The main research question is the following:

- How does digitization transform administrative procedures?

Additionally, we formulated the following three sub-questions:

- What are the impacts of digitization on the time required to implement and provide an administrative service?
- How does digitization modify roles and skills of civil servants'?
- What are the impacts of digitization on the services provided to the users?

With a view to investigating our main research objective and the set of the three secondary research questions, we proposed several specific theoretical assumptions, some of which we will discuss further on. Later in the paper, we will explain the tests conducted on these hypotheses. Additionally, on the basis of these theoretical concepts, we will explain the research methods we selected to collect relevant data. We also have to highlight that the theoretical assumptions made below are linked to the dimensions that we want to analyse.

H1: Digitization in the public sector drastically alters administrative procedures.

Digitization of administrative procedures affects, to an important extent, the execution of public services. Equally, we expect that the administrative activities will become simpler and that the complexity of transversal administrative procedures can be reduced.

H2: Digitization in the public sector will accelerate administrative procedures.

We assume that the digitization of public services can significantly reduce the time required to process and deliver a service (processing time). Therefore electronic data transmission and information sharing can also make the communication between users and administrators faster, as in most cases reporting to the administration office is no longer required. Time can be gained as well by providing information online, by the automation of the key steps of the decision-making process and the provision of services (potentially fully digital).

H3: Digitization in the public sector changes employee skill requirements.

Our hypothesis is that labour organisation is also affected by technological innovations. Changes are brought about in the management of human resources, too, as professional entities in an e-Government environment are redefined. We wish to examine whether the task automation and dematerialisation can eliminate some tasks traditionally performed by civil servants, allowing employees to focus on more rewarding and productive administrative tasks. However, at the same time, the simplification could lead to the elimination or reclassification of some positions and workplaces.

All of the previous scenarios show significant relationships between the basic elements of our research, and they will help us make substantial judgments.

Within our study, in an attempt to answer the key questions, we combine research methods, and we integrate both distinctive research strategies, namely qualitative and quantitative methods.

Regarding qualitative methodology, we aim to gather an in-depth understanding of behaviours of collecting relevant data. Similarly, these behaviours will help us investigate the causes and the means of digitizing administrative procedures. In order to gain an understanding of these reasons, we will rely on gathering information from field observations, document analysis, and review of records, and we will collect data from semi-structured interviews. As part of this, our study involves three research case studies, from which further analysis will follow.

In addition, the quantitative methodology enriches our research through the collection of numerical data, exhibiting the theoretical concepts in combination with the reality. The empirical investigations via statistical or numerical data have as an objective to test our hypotheses. Through structured techniques such as an online questionnaire, we will measure the incidence of various views and opinions, and we make an attempt to quantify data and to generalise the results, as discussed in the following sections.

2. Analysis model

Regarding the investigation into digitization of administrative procedures, we created an analysis model by combining our research questions with the dimensions of interest previously described. This model will enable us to test our research hypotheses and to find any possible affiliation between the variables.

More specifically, for each one of the dimensions that we want to explore, we have identified what we believe to be an adequate set of indicators based on our literature review. The observation of these indicators should lead us to measure more finely the impacts. Let us also mention that the model presented below includes a limited set of indicators, for the time being.

Moreover, we will consistently apply the analysis model to data gathered through qualitative and quantitative methods. In the long run, these applications will also be used for exploratory identification of other impacts on the management of administrative procedures.

Table 1. Analysis model

DIMENSIONS	INDICATORS
<i>Administrative Tasks</i>	Volume of services provided by electronic means Extent of the use of services offered by the traditional means (paper)
<i>Time</i>	Time required to request a service Time required to provide a service
<i>Roles</i>	Number of people involved in providing a service Need to recruit new specialized employees Need for trained staff to adapt to new tools of e-services
<i>Services offered to the users</i>	Number of activities involving several departments to provide a service Request of documents; Reduction of volume of document requests Existence of aid or technical support of a service (call centre, help desk, information desk, etc.)

We are aware that digitization of administrative procedures might have considerable economic impacts as well. However, these financial dimensions are difficult to define, e.g. civil servants in Switzerland are usually not dismissed, even if their jobs are replaced by information systems. It is very hard to quantify the return on investment of a digitized procedure. Moreover, access to public financial data can prove quite complicated. Therefore, we decided not to cover this area in the present study, rather to use proxy indicators to estimate the financial impacts, i.e. by combining time and skill indicators.

As mentioned in the introduction, numerous studies exist on service provision from the demand side, and this is why we also left user satisfaction out of the scope of this research.

3. Questionnaire Survey

As mentioned above, analyses of the impact of digitization in the public sector are rare. The lack of corresponding data has led us to search for methods to produce the data needed to investigate this rather unexplored area. We thus chose to develop an online questionnaire to collect exploratory data on our topic of investigation.

We chose the Swiss public administration as the main field of our research, and we created French and German versions of the questionnaire. This was a web-based survey, inviting prospective respondents to visit a website on which the questionnaire could be found and completed online. The questionnaire was sent to more than a thousand contacts throughout Switzerland, and civil servants of all levels of administration were asked to answer it.

As the purpose of this survey was to explore the domain and to have the first records of the reality of Swiss administrative, we adapted the content of the questionnaire to the dimensions and the assumptions noted in the sections above. Through the framework of the questionnaire, the indicators were applied equally to the dimensions of interest, as we have already analysed in the model analysis.

3.1. Preliminary Results

At this point, we have to underline that ours is an exploratory survey on a convenience sample and that its results can by no means be generalized. Indeed the collected answers just give us indications of the reality of Swiss public administrations. Furthermore, only 74 out of 177 respondents finished the whole questionnaire, which we assume is because the issues are rather complex and that this fact might have discouraged them.

As indicated above, we created an identical online questionnaire, in French and in German, addressed to the appropriate French and German speaking parts of Swiss administrations. In order to facilitate the presentation and the analysis of the results, we merged the results of the two versions of the questionnaire.

The preliminary results clearly show that information technology is used in the public sector more for information provision than for a fully online provision of services. In the Swiss public reality, a limited number of complex administrative procedures can be conducted fully through electronic service channels.¹

Comparing the tendencies between the usage of the paper services and the new electronic versions, we found that the administration as well as its users mostly prefer using electronic means to access documents and information (Figure 1).

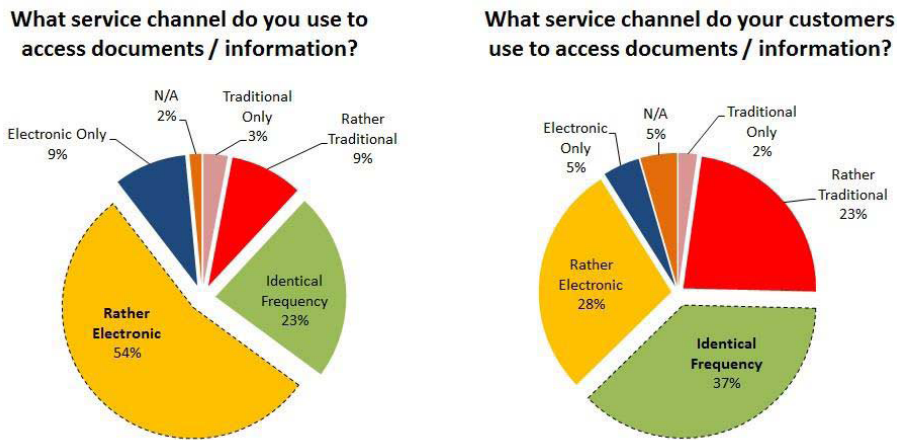


Figure 1. Service Channel used for accessing documents/information

The results indicate that the more complex a service, the less the electronic means are used. For a simple service (structured service²), the electronic service channel is preferred. However, for complex (semi-structured) services, users seem to prefer the traditional service channel¹ (Figure 2).

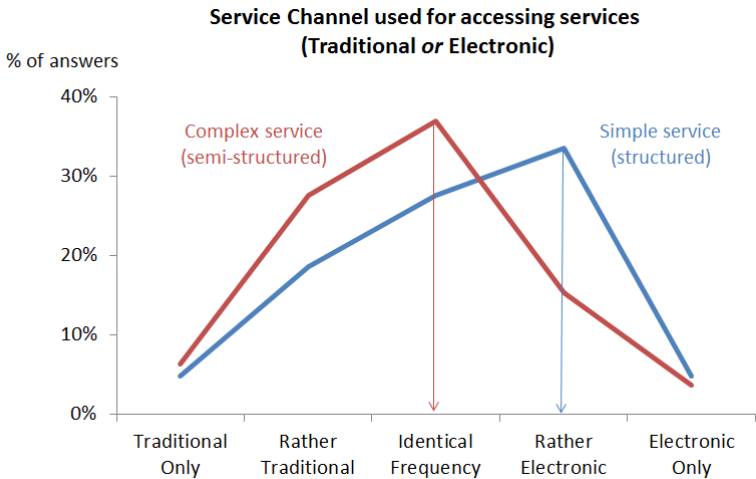


Figure 2. Service Channel used for accessing services

Likewise, according to the respondents' answers, only 10%³ of semi-structured services (complex services) are fully available online. Indeed, 43% of the participants

affirmed that “No or very little” semi-structured services are integrally delivered online (Figure 3).

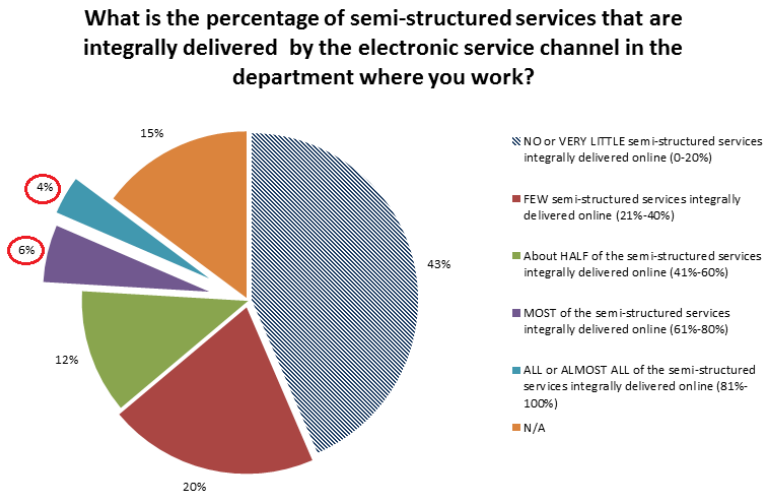


Figure 3. The percentage of the semi-structured services integrally delivered electronically

4. Case Studies

In an attempt to deepen our investigations, we decided to focus on just one administrative service. The service needed to have a reasonable degree of complexity to study, combining internal and external tasks to be fulfilled respectively by civil servants and users. We chose the building permit process as the most appropriate administrative procedure for our study. First, it fit our criteria in terms of complexity, number of stakeholders involved, time, etc. Second, it was convenient because several Swiss cantons are currently introducing such online procedures, making it possible for us to conduct a longitudinal survey. This allowed us to compare the two ways of delivering this administrative service.

Indeed, as already described in the analysis model section, the traditional way of delivering administrative procedures is through paper versions, whereas the digital way involves using ICT means. In order to collect real data, which could describe the changes made, we plan to measure this procedure over time, i.e., before and after digitization.

For various reasons (the processes of which would be too long to detail here), we selected three different case studies. Since there are no cantons that have completely digitised the procedure of the building permit (or long enough ago to provide us with reliable data), we believe that a comparison of the same or similar provisions of service through various cantons would be very helpful. These three cantons have different levels of maturity in terms of providing online building permit procedures, which allows us to make a lateral survey as well.

The advantage of a case study is that it recognises the complex nature of the subject of concern in a coherent and integrated way. There are many factors and barriers that face the process of issuing building permits, as for example the legislation and the problems aligned with local administrations [8].

Hence, taking into consideration all the elements mentioned above, we chose the cantons of Geneva, Neuchâtel, and Valais for the main field of our case studies. These three cantonal administrations agreed to be the objects of our survey.

Initially, document analysis is taking place on relevant public administrative documents and laws supplied by the administrations. We are currently exploring the documentation that the cantons provided us regarding building permits.

Second, we are conducting site visits to different areas of cantonal Swiss administrations. The core part of our study is to conduct a series of semi-structured interviews with the main key actors and stakeholders. These are planned with approximately ten people per canton, with interviews lasting around one hour. As semi-structured interviews consist of general open-ended questions, which can vary and be adapted according to the characteristics and the answers of the interviewees [9], we developed an interview framework on the basis of our analysis model.

Factors such as the size and type of government and the included professions will be taken into consideration for the selection of a representative sample of interviewees. In cooperation with relevant authorities, we want to collect information that would help us to approach certain topics in depth and to clarify ambiguities.

In the case of Geneva's canton, we will have the opportunity to study and analyse data before and after the digitization of the procedure, because a simplified online procedure for building permits was introduced in September 2013. It constitutes an innovative service, fully available online, which until now has been performed through the traditional paper channel.

In Neuchâtel's canton, the paper version has also mainly been used up to now. However, they do have a progress monitoring system for the building permit procedure, and starting in 2014, they will allow the usage of a paperless document system for several services or procedures.

Finally, in Valais's canton, the main parts of the administrative procedure of building permits are based on the traditional paper channel. However, some data on building permit procedures is available in their own internal management system, and applicants can be informed online about the progress of their building permit applications.

So far, we have already interviewed some of the different parties, including external parties from the private sector who are involved in the process of issuing building permits in these three cantons. All interviews are scheduled to take place by the end of December 2014.

5. Conclusion – Future Work

This ongoing study focuses on exploring the impact that digitization has on the management of administrative procedures, and we hope to contribute to filling a gap regarding this research subject.

In order to do so and to gain a deeper understanding of this research area, we used four core dimensions: administrative tasks, time, roles, and services offered to the users of public administration. Using these dimensions, we defined our research questions as well as an analysis model based on qualitative and quantitative methods.

Moreover, with the aim of collecting relevant data, we are using a combination of research methods. First, an online questionnaire was designed to assess Swiss administration usage of e-Government, evaluating the main variables. Second, in

combination with the intention to measure the procedure over time, this research includes three comparative cantonal case studies on procedures of building permit application. Within the context of three cantons, we are organising a series of semi-structured interviews with key stakeholders.

The next steps in this research will be to finalize the semi-structured interviews, and to transcript and code them. After this is done, we will start our analysis by using qualitative data analysis software. This should help us identify and define composite indicators to measure complex situations. For instance, a combination of the number of people who are involved in providing a service. The number of administrative units and the number of transverse activities between administrative units can give us an approximation of the level of complexity.

In the context of our future work, according to the model outlines described above and by combining the three cantonal cases, we hope to identify a number of similarities as well as differences that will help us clarify the real conditions of the current efforts of digitization of the Swiss public administration.

Endnotes

1. The term "Service Channel" defines the way in which a service is requested and delivered. We have distinguished two types of service channels: 'Traditional Service Channel,' which includes paper services, telephone and fax; 'Electronic Service Channel,' which includes services through e-mail, the Internet and social networks.
2. Structured services have predefined rules and are characterized by low flexibility (potentially fully automated). An example of such is the request for a certificate of residence. Semi-structured services have also predefined rules, but they still require human intervention concerning a decision regarding providing the service, i.e. the allocation of a building permit.
3. 10% = 6% "Most of the semi-structured services integrally delivered online" + 4% "All or Almost All of the semi-structured services integrally delivered online."

References

- [1] R. O'Leary, D. M. Van Slyke, and K. Soonhee, Editors, *The future of public administration around the world*, Georgetown University Press, Washington, 2010.
- [2] K. Layne and J. Lee, Developing fully functional E-government: A four stage model, *Government Information Quarterly*, vol. 18, no. 2, (Jun. 2001), 122–136.
- [3] C. G. Reddick, A two-stage model of e-government growth: Theories and empirical evidence for U.S. cities, *Government Information Quarterly*, vol. 21, no. 1, (Jan. 2004), 51–64.
- [4] A. Tat-Kei Ho, Reinventing Local Governments and the E-Government Initiative, *Public Administration Review*, (2002), 434–444.
- [5] V. Homburg, *Understanding E-government: Information systems in public administration*, Routledge, New York, 2008.
- [6] R. Heeks, Understanding and measuring e-government: International benchmarking studies, *UNDESA workshop E-Participation and E-Government: Understanding the Present and Creating the Future*, Budapest, Hungary, (2006), 1–44.
- [7] R. M. Peters, M. Janssen, and T. M. Van Engers, Measuring e-government impact: Existing practices and shortcomings, *Proceedings of the Sixth International Conference on Electronic Commerce* (2004), 480–489.
- [8] M. M. A. Wahed, M. M. El Barmalgy, and M. R. Haggag, Towards an advanced mechanism to benefit from information systems in issuance of building permits, *HBRC Journal*, vol. 8, no. 1, (Apr. 2012), 58–63.
- [9] A. Bryman, *Social Research Methods*, Oxford University Press, New York, 2012.

Modeling tools of service value networks to support social innovation in a Smart City

Enza GIANGRECO^{a,1} Lanfranco MARASSO^a, Valentina CHETTA^a

Laura FORTUNATO^b, Cosimo PERLANGELI^b

^aEngineering-Ingegneria Informatica SpA

^bUniversity of Salento

Abstract. The scarcity of public funding collides, today, with a growing demand for social services by the citizens. In this context, the main challenges that governments face in the welfare service sector are the need to improve economic and social sustainability of the service and the creation of public value. This paper presents a new model of sustainability based on the concept of generative welfare. Through the cooperation of different public and private actors, citizens (Public-Private-People Partnership - 4P) and the use of ICTs such as the Idea Management Systems and Gamification techniques, our methodological approach aims to analyze a service value network, model the key processes, identify structural holes and turn them into new public-private business opportunities. This approach, carried out within the Living Lab Puglia Smart Lab, was adopted for the service of collection and redistribution of excess food in the city of Lecce, called "Solidarietà in rete". The results achieved have allowed to identify significant solutions for the optimization of the value network and to support the development of an IT platform, able to manage this service. This platform enables gaming mechanisms that encourage citizens' participation.

Keywords. Welfare, Service Sustainability, Value network.

Introduction

Public administrations, due to the lack of public funds, are obliged to find new solutions for the development of the city, to allow the rationalization of resources and to make delivery services more efficient, according to the needs of citizens. Against this background, the concept of the 'smart city' [1] has recently been introduced as a competitive model of a city, able to ensure a better quality of life, thanks to really useful, efficient and sustainable services, through the cooperation of different public and private actors, citizens (Public-Private-People Partnership - 4P) [2] and the use of Information and Communication Technologies (ICTs).

It's important to specify that the word "smart" does not imply exclusively the use of digital technologies, but considers the central role of citizens, the use of ICTs and new methodological approach, as tools able to support social innovation. In the "smart city" context, this paper proposes a methodology to analyze a service value network, identify structural holes and turn them into new public-private business opportunities for co-creating new innovative and sustainable services.

¹ Corresponding Author.

The research and methodological challenges are related to a real life context and to real citizen's needs. The practical problem related to the research questions is: How can public-private welfare services be sustainable? To answer this question we have developed a case study in a living lab context (Puglia Smart Lab²). The implementation and analysis of this case study allowed us to create the methodology proposed in this paper. This methodology has, as its main aim, the identification of the public-private business opportunity, able to optimized service value network analyzed with the case study. The case study is related to the service of collection and redistribution of excess food in the city of Lecce, called "Solidarietà in rete".

1. Background

As already indicated in the introduction, our research domain aims to provide a new approach to analyze and evaluate a public-private service value network.

For this purpose, some important methodologies were used for the identification and visualization of actors and goods of the exchange network and for the acquisition and modeling of the workflow processes.

1.1. Value Network Analysis

A value network is any network of relationships that generates tangible and intangible value through complex dynamic exchanges between two or more individuals, groups or organizations. Any organization or clusters of organizations, in private and public or governmental sector, committed in the business of tangible and intangible nature, can be seen as a value network.

To better manage value creation in the knowledge economy it is necessary to have a clear vision of the role that intangible assets play in the corporate business model, as well as a depth understanding of the dynamics of the network of which the company belongs to [3].

The Value Network Analysis provides a methodology useful to model, analyze, evaluate, and improve the ability of a business to transform, both tangible and intangible assets, in other forms of negotiable value. Verna Allee [4] maps the value exchange as a flow diagram where arrows represent the tangible and intangible exchanges.

This methodology has been successfully deployed in the European Commission to better understand the impact of research networks on Intellectual Capital formation and competitiveness in regions [5].

1.2. Stakeholders Management

To have a complete view and understanding of the relation characterizing the parties involved in the tangible and intangible exchanges, it is essential to define importance, strengths and weaknesses of each actor.

² The Living Lab is the first tangible result of Puglia@Service a project supervised by the technological district Dhitech scrl and co-funded by the Italian Ministry of Education, Universities and Research as a part of the Research & Development piano Operativo Nazionale 2007/2013. <http://www.pugliasmartlab.it/>

A very pragmatic and comprehensive approach of the Stakeholders Analysis, developed by Zimmerman and Maennling [6], is able to answer this question because it is a very flexible analysis and can be adapted to any context and characteristic of the stakeholders involved.

The purpose of this analysis is to identify, in relation to the objective of the network analyzed, those stakeholders influencing the decision-making process through their ability, skills and relations with other actors.

The previous empirical studies, focused on the acquisition of the potential of relevant stakeholder and the changing in perspective regarding the cooperation landscape, make important this analysis.

1.3. Process modeling and management

The technical literature is very rich in recommendations for the companies about the need to take actions to innovate their own business activities and operations [7]. All these indications have something in common: a strong emphasis on the need to understand the business processes with the aim of improving them.

The processes are considered strategic assets that need to be analyzed, managed, and improved, to provide better products and value-added services for customers.

The BPM uses a systematic approach that aims to design processes, deploy run-time processes, monitor and manage those processes, and report and analyze the performance of those processes, in order to improve and modify them according to the business objectives [8].

In recent years, also, the government organizations have recognized the benefits of BPM, redefining, restructuring their processes and service delivery [9]. For government agencies, if properly implemented, BPM facilitates the processes of oversight, and makes easier the management of finances, finding bottlenecks in processes, and responding to new legislative and executive directives. It may mean saving money and improving services to citizens, by making easier the interaction within and among departments and agencies [10].

This work intends to highlight the usefulness of the BPM for the co-creation and sharing of goods and services in the public-private network for the development of a smart city.

1.4. Structural holes

Starting from information derived by the process modeled, in the value network there may be some "holes" where something is provided without receiving anything back.

Ronald Burt [11] introduced the term "structural holes" referring to positional advantage/disadvantage of individuals resulting from the way in which they are positioned within a network and neighbors. A structural hole is a relation of non-redundancy between two actors in a network. Redundant ties are those relations connecting the same people, providing the same benefits within the network.

On the basis of this definition, one stream of literature, captained by Burt [11], tends to underline the importance of sparse networks for diversity of knowledge, information, resources, and perspectives. Conversely, another stream, captained by Coleman [12], stresses the importance of the creation of dense networks because these connections create a social structure that favors communication, coordination and trust among the people involved.

According to Coleman, we believe that closed networks facilitate the exchange of goods and services, in order to increase the public-private cooperation [13].

2. Research Methodology and case study

The tools and methods underlined previously are the basis of methodology presented in this paper and they support the implementation of the case study analyzed.

The innovation of our methodology consists in the integration of these methods widely known and applied in the literature, in order to provide a significant solutions for the optimization of the value network and to support the development of an IT platform, able to manage the public service.

The methodology is characterized by a sequence of steps with continuous feedback. Each step has some input, output, activity and deliverables [14]. To facilitate the understanding and demonstrate the applicability of the methodology, for each step was presented the corresponding part of the case study.

The choice of the steps presented below derives mainly from the analysis of the value network of the case study analyzed: this network involves different actors, with different positions and roles establishing relationships of a different nature.

It is also important to consider that, this methodology applied in the service value network analyzed, can be continuously improved, thanks to interaction with all stakeholders and thanks to new context and needs analysis.

The methodology considers five steps (fig. 1).

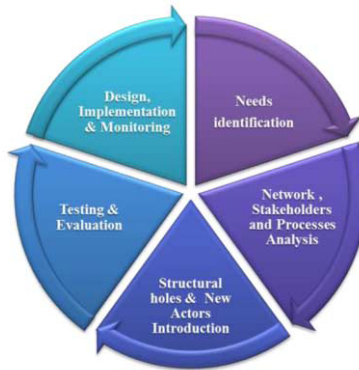


Figure 1: The Research Methodology

2.1. Step 1: Needs identification

The first step consists of analysis of the real needs of citizens using the innovative approach of the Living Lab, a space where citizens, public administrations and enterprises can work together, on an equal basis, in order to identify and cover the urgent needs of the territory.

The implementation of this methodology started within the Living Lab ‘Puglia Smart Lab’. In order to support the participation of citizen in the Living Lab it is realized an Idea management system³ (IMS). The IMS enables knowledge sharing and

³ <http://www.ideeperlecce.it/>

the opportunity to develop and design ideas in order to promote the emergence of new economic initiatives.

In a perspective of co-experience that has seen the involvement of the City of Lecce⁴ and the Caritas of Lecce⁵, the Living Lab ‘Puglia Smart Lab’, thanks to Idea Management System, aims to optimize the process of collection and redistribution of excess and unsold food to citizens in distress.

In this step have been identified the citizens needs and the public utility areas.

2.2. Step 2: Network, Stakeholders and Processes Analysis.

From the data extracted in the first step, we define the network of collection and redistribution of excess and unsold food to citizens in distress as an AS-IS context, in which implement the process of innovation.

To analyze this network will be used *Value Network Analysis* proposed by Verna Allee, *Stakeholders Analysis* proposed by Zimmerman & Maennling and the *Business Process Management Notation (BPMN)*. Because the final focus of the proposed methodology is the optimization of the public-private service value network, in which the value is co-created with citizen, it’s important to analyze the network with different levels of detail, considering the relations among people, technology, knowledge and processes. The optimization of a public-private service value network requires the changing of the whole socio-technical service system.

Were taken into account three levels of analysis.

First Level. The representation of the value network with the formalism proposed by Verna Allee is provided in this level. The *Exchange Analysis* [3] of the service value network is also applied. A description of the value network, of actors involved, of the nature of the exchanges (tangible and intangible assets) among them and of the operational properties of each actor, is given as follows.

To curb a situation of poverty that, in recent years, has become a real social emergency, the Caritas distributes hot meals at various soup kitchens located in different districts of the city. In addition to this, there is a project "Emporio della Solidarietà", a supermarket with automated teller machines, trolleys, shelves and signs, where to find free basic necessities. To deliver these services, both the Caritas and the Emporio della Solidarietà, can count on a series of contacts with various outlets, that offer their food to then be allocated to the soup kitchens.

Other aids and food come from different Emporio’s partner companies, from various government agencies, such as the Civil Protection Department, from some charitable institutions such as the “Banco delle Opere di Carità” and from schools. The Italian Red Cross is also involved in the network, distributing food and hot drinks to homeless and families in difficulty.

The institution CAF⁶ verifies and manages prerequisites of citizens requesting the service. Confindustria Puglia⁷ supports the Emporio through management and communication of fundraising initiatives.

⁴ Department of Social Affairs and Equal Opportunities.

⁵ Organization of the Diocese of Lecce for the promotion and coordination of charitable initiatives.

⁶ Italia Fiscal Assistance Center

⁷ Industry associations in the provinces of Puglia

Important contributions come from the public community, i.e. citizens, parishioners and volunteers through various offers, initiatives and volunteering activities.

In addition, there are a lot of intangible flows among Caritas, Emporio, Public Administration and food providers. These flows are mainly information about assistance activities or services and gratification or social consensus for providers, volunteers and shops, who donate food or money.

Through weekly meetings and interviews and using Value Network Analysis it was possible to map the network related to the flow of tangible and intangible value. As explanatory example of such work, the trade flows from intangible assets among the various actors of the network were provided in figure 2.

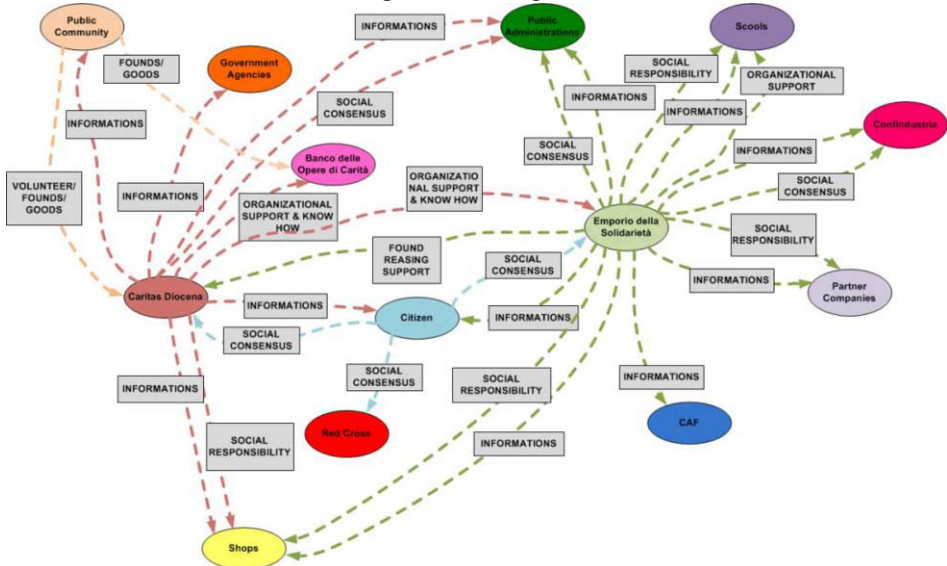


Figure 2: Intangible assets in the AS-IS Service Value Network

Second Level. In the second level of analysis was made the classification and actor's network mapping to identify the primary, secondary and key actors.

Through the Stakeholder Analysis, the actors involved were categorized in three classes: stakeholders with strong legitimacy (Confindustria Puglia, Caritas, the City of Lecce and the citizens), stakeholders with control over essential resources (citizens, Caritas and Emporio Solidale) and strongly networked stakeholders (partner companies and shops that donate food to Caritas and Emporio, Schools, Government Agencies and the Red Cross).

The result is that actors as the City of Lecce, Caritas, 'Emporio della Solidarietà' and citizens are the key actors of the network; the various food providers, the Government Agencies and the Red Cross are primary actors, while the others are secondary actors (fig. 3).

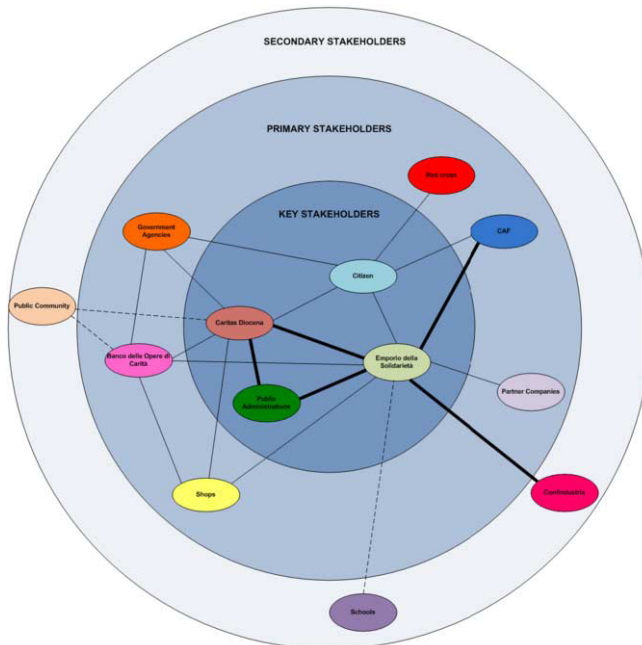


Figure 3: AS-IS Stakeholder mapping

Third Level. To identify the integration level of activities carried out by key actors of service value network, the key actors’ processes have been modeled using the BPM tools.

The modeling of the processes related to the service of access request of the Caritas and “Emporio della Solidarietà” has allowed to understand that, these processes, not integrated and structured, causing waste of resources.

2.3. Step 3: Structural Holes and new actors introduction.

The analysis of the service value network allows identifying the main criticalities of the network, previously defined as *structural holes*. In this step it will be possible to identify:

- The lack of co-operative relations among different actors that leads to the generation of the asymmetric information, no positive redundancy and absence of bridges among the various actors;
- Actors and initiatives not horizontally integrated with absence of central coordination;
- Ego-centered actors;
- The lack of shared vision between the actors’ network and the lack of cooperation between the network nodes.

By using this information, new solutions (new actors, new processes, new deliverables, new technologies, etc.) can be proposed, able to optimize the service value network and generate new business opportunity.

In the case study analyzed, the main structural holes found through the use of the previous three levels of analysis and through the interview to Key actors are:

- The absence of cooperative relations among the core activities, causing useless flows and replication of initiatives,
- The prevalence of intangible flows than tangible flows and low efficiency and effectiveness, due to a misalignment between times and objectives, and
- The inadequacy of network's size, i.e. long times to supply the food and main services and a higher demand for services.

The TO-BE network, an ideal network, was created to bridge structural holes identified. In this network were introduced new players and links.

In the opinion of the Public Administration and the other key stakeholders of the network of the Living Lab, the TO-BE network represents a solution economically sustainable.

A new actor, the logistic provider, has been included because it allows a faster and efficient movement of food from suppliers to the Caritas and the Emporio. Furthermore, more food vendors, as restaurants and pubs of the city, can be introduced in this mechanism because they can offer the exceeding food, not sold or near to expire. The Public Administration of Lecce would give some tax incentives for these donations.

It would be desirable also introducing Italian local health authority (ASL) to regulate specific rules concerning the transport conditions of food products, in order to preserve the nutritional properties. Another actor, a computer services provider, will carry out a series of activities aiming at structuring the processes of the Caritas.

This actor, also, will produce an intelligent platform that manages all activities of food distribution and all administrative, fiscal, sanitary/health and logistical aspects.

2.4. Step 4: Testing and evaluation.

The inclusion of new actors within a complex system requires more than a simple qualitative analysis. It's necessary to implement a quantitative analysis to assess and validate the innovation policies adopted. The quantitative analysis used in this work is the structural holes analysis proposed by Burt. But, unlike Burt that hopes the existence of structural holes in a social network in order to broker flow of information between people, we believe that in the service value network considered in the case study, it is desirable to reduce the structural holes. More redundant ties, in fact, facilitate the exchange of goods and services and increase the public-private cooperation.

In quantitative terms, if the Efficiency, defined by Burt, allows calculating the percentage of ego's neighborhood ties, which are non-redundant, we define with the Resilience (eq.1) that the extent a ties of ego with alter, is redundant. This parameter can therefore give useful information on the impact of ego on the entire network. The increase of Resilience involves an increase of redundant contacts number in the network, in order to minimize the number of structural holes.

$$Resilience = 1 - Efficiency \quad (1)$$

To calculate this parameter, the adjacency matrix of the two networks previously described, the network as-is and the network TO-BE, has been obtained. Starting from the calculus of the Efficiency, proposed by the theory of structural holes [11], the Resilience equation (eq. 1) was applied for each actor of the two networks.

Comparing the value of resilience obtained (the new nodes have been clearly ignored, because they are present only in one of the network), it is observed an increase of the resilience for the most part of the nodes of the network. The other nodes present a constant resilience because they were not affected by the introduction of new actors and ties. This trend demonstrates a decrease of the structural holes identified and, consequently, an improvement of goods and services distribution among the actors of the network.

	As-Is Resilience	To-Be Resilience
Government agencies	0,22	0,44
Banco delle opere di carità	0,39	0,39
Caritas	0,17	0,27
Citizen	0,20	0,35
Emporio della solidarietà	0,09	0,18
Public Administration	0,29	0,49
Shops	0,28	0,52
Red Cross	0,00	0,36
CAF	0,47	0,49
Partner companies	0,00	0,00
Confindustria	0,00	0,30
Schools	0,00	0,31
Public community	0,44	0,44

Table 1. Comparison of the resilience value

2.5. Step 5: Design, Implementation and Monitoring.

The TO-BE service value network, identified and validated in the previous phase, has been redesigned using the BPMN graphical formalisms and the formalism of the Value Network proposed by Verna Aleo. Also in the face of these first outcomes, the Municipality of Lecce, the Italian Red Cross, Civil Protection and various food shops of the city, are currently evaluating the enforcement of a first experimental network, in order to verify the optimization of the distribution of not consumed or not sold food to Caritas and others charities entities.

A mobile application has been developed to facilitate the matching between demand and supply of not sold food, but still suitable for consumption. Also, have been used the gamification principles and the application of the concepts of game theory and techniques to non-game contexts [16] [17] to involve citizens and foster the co-design service. After all we proceed with the implementation of the identified solution and the consequent monitoring. The Living lab will be the direct channel for the interaction between citizens and service providers thus determining the restart of the methodology.

3. Conclusions, limitations and future research

The Public Administration does not act alone in the implementation of any type of service, but cooperates and interacts with a high number of actors, thus creating a network structure, that is, a complex service value network.

The methodology proposed in this paper allows identifying new public-private business opportunity able to optimized the service value network analyzed. In our society despite of the significance of sustainability models for social welfare services, it has received limited attention in scientific literature. This paper intends to bridge this

gap by focusing on a particular welfare services, called "Solidarietà in rete" provided by the Public Administration, related to the food assistance of Lecce's people and families. This case study allowed to explore a new sustainability model of welfare service able to transform costs into investment and able to generate, not only social value, but also economic opportunities. Subsequently, due to the combination of different tools, such as Value Network Analysis, Multi stakeholders Management and Business Process Management, different structural holes have been identified and analyzed. In the face of these results has been considered the possibility of introducing new ties and involve new actors, in order to allow an innovation and an overall improvement of the network. It is desirable, in the future, to analyze the results of the new network "Solidarietà in rete" to quantify (i.e. number of people helped, number of meals provided, number of volunteers, etc.) the effective network optimization. An additional Testing and Evaluation analysis about this case was performed using the System Dynamics approach [18]. This methodology could be applied to other types of social services, thus offering more opportunities to study and implementation.

References

- [1] Rudolf Giffinger, Christian Fertner, Hans Kramar, Robert Kalasek, Nataša Pichler-Milanovic, Evert Meijers, *Smart cities – Ranking of European medium-sized cities*, Vienna, Centre of Regional Science, 2007.
- [2] Wisa Majamaa, *The 4thP - People- In Urban development based on public private part-nership*, Helsinki University of Technology, 2008.
- [3] Verna Alee, *A Value Network Approach for Modelling and Measuring Intangibles*, Presented at Transparent Enterprise, Madrid, November 2002.
- [4] Verna Alee, Value Network Analysis and value conversion of tangible and intangible assets, *Journal of Intellectual Capital* **9** (2008), 5–24.
- [5] Verna Alee and Oliver Schwabe, *Measuring the Impact of Research Networks in the EU: Value Networks and Intellectual Capital Formation*, European Conference on Intellectual Capital, Haarlem, The Netherlands, 2009.
- [6] Arthur Zimmermann and Claudia Maennling, Mainstreaming participation, *Multi-stakeholder management: tools for stakeholder analysis, 10 building blocks for designing participatory systems of cooperation*, from the series: Promoting participatory development in German development cooperation. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, 2007.
- [7] M. Hammer, J. Champy, *Re-engineering the Corporation; A Manifesto for Business Revolution*, Harper Business, New York, 1993.
- [8] Harmon, Evaluating an Organization's Business Process Maturity, *Business Process Trends* **2**, 2004.
- [9] Gartner, *Hype Cycle for Smart Government*, 2013.
- [10] Layna Fischer, 2009 *BPM and Workflow Handbook: Spotlight on Government*, Future Strategies, 2009.
- [11] Burt, R. S., *Structural holes: Social structure of competition*, Harvard Business Press, London, 1992.
- [12] Coleman, J. S., Social capital in the creation of human capital, *American Journal of Sociology*, **94**, (1988), 95–120.
- [13] Matteo Caroli and Caterina Tantalo, *Le Reti d'Imprese come strumento privilegiato per la diffusione di una Sostenibilità di Sistema*, Luiss business school, 2009.
- [14] Karl Johan Aström and Richard M. Murray, *Feedback Systems - An Introduction for Scientists and Engineers*, Princeton University Press, 2008.
- [15] Lanfranco Marasso et al., Idea Management System for Smart City Planning, *Interdisciplinary Studies Journal, Special Issue on Smart Cities*, **3**, (2014), 227-236.
- [16] B. Stokes, Videogames have changed: time to consider Serious Games?, *The Development Journal*, **11** (2005).
- [17] G. Zichermann and C. Cunningham, *Gamification by Design: Implementing Game Mechan-ics in Web and Mobile Apps*, O'Reilly, Sebastopol, 2011.
- [18] Enzo Bivona, Enza Giangreco, Valentina Chetta, Mona Soufivand, *Towards a sustainable social delivery system through Public-Private Partnership: a conceptual System Dynamics Approach*. IFORS Barcelona, 2014

Administrative and Digital Literacy: the Legend or Myth in e-Government

Bojan CESTNIK^{a,1} and Alenka KERN^b

^a*Temida d.o.o. and Jozef Stefan Institute, Dunajska cesta 51, 1000 Ljubljana, Slovenia,
bojan.cestnik@temida.si*

^b*The Housing Fund of The Republic of Slovenia, Poljanska cesta 31, 1000 Ljubljana,
Slovenia, alenka.kern@ssrs.si*

Abstract. New literacies are often used to denote the abilities to swiftly use data, information and knowledge in the modern age. In this paper we re-examined the hypothesis that a citizen having higher digital and administrative literacy would more frequently and with a higher success rate use e-government services. We analysed the collected applications received to a tender conducted by a public housing institution for renting flats under favourable conditions to citizens. The concerned citizens were intentionally offered two possibilities for submitting their applications: in paper form by the ordinary mail or in electronic form via the internet. The electronic web form was designed to be simple and easy to access, use and navigate; submitting and completing the application for renting flats through the web was of the same, if not of the lesser, complexity than filling and sending the same application by the ordinary mail. Contrary to a popular belief that the electronic submission would be typically preferred by more digitally and administrative literate citizens, the results of our study indicate that the completeness of submitted applications by the ordinary mail was significantly better than the completeness of the applications submitted via the web form. There is an agreement that citizens' digital literacy has to reach a certain level in order to start successfully using the available e-government services. However, our results indicate that a high digital literacy might not be enough. In some cases it not only ceases to help, but might also degrade the overall performance and success of a citizen using e-government services.

Keywords. Electronic services, electronic government, digital literacy, administrative literacy, digital divide

Introduction

The implications of administrative and digital literacy to the level of inclusion in e-service society has received a broad attention in e-government research publications and reports [e.g. 1, 2, 3, and 4]. The authors generally argue that the inclusion of citizens in e-service society requires substantial skills and knowledge, mostly from the field of informatics and computer science. Therefore, adequate digital literacy is required to be included in e-service society. There are certain access barriers and unequal social and economic opportunities that are the main causes for digital divide [1]. On the other hand, administrative literacy is the ability to navigate bureaucracy in

¹ Corresponding Author: Bojan Cestnik, Temida d.o.o. and Jozef Stefan Institute, Dunajska cesta 51, 1000 Ljubljana, Slovenia, bojan.cestnik@temida.si

terms of finding forms and following procedures required to fulfil certain tasks [3]. The relation between the two literacies has not been yet explicitly studied; however, in the context of e-government the two literacies are often discussed in the same context and taken as correlated.

In the last decade full online availability and sophistication of benchmarked e-services in many European countries showed steady improvement and reached nearly 100% [2]. The actual average for online availability in Europe has reached impressive 71% in 2009, while the sophistication measure, which denotes the degree of interaction between service provider and user, stands at 83%. The EU policy goals for the year 2010 clearly stated that there should be no citizen left behind with regard to the inclusion in e-Government procedures. Although the online availability figure for Europe is remarkably high, citizen's participation does not exhibit the same manners. The fact that citizens' participation and usage of the available services remains relatively low (below 50%) is often contributed to some sort of exclusion, intentional or non-intentional digital divide, from e-service society [2]. Much work needs to be done to understand and engage citizens, as well as to build their trust and confidence. The issues related to these topics are often included in national e-Government strategies [5]. Following these guidelines, fields like, for example, customer insight, user-centred web design, unified access, data security, theme and life-event orientation, and customer involvement in service design have to be investigated.

Requirements for higher administrative and digital literacy of the whole population for smoother inclusion in e-services society have been identified in several research studies [e.g. 1, 3]. Grönlund and colleagues [3] argue that the need for skills and knowledge decreases when services become electronic, and hence more people are included as more people are able to understand information. Simultaneously, the nature of skills might change when services become electronic and hence different people are included or excluded in the process.

In this paper we address the issue of relation between digital literacy and administrative literacy. More specifically, the question is if the higher digital literacy required by a person for using e-services also implies higher administrative literacy. We formulated two hypotheses related to the research question:

Hypothesis 1: Citizens with higher digital literacy will be more inclined to use electronic services than less digitally literate ones.

Hypothesis 2: Digital literacy is positively correlated with administrative literacy. A person with a higher digital literacy will likely exhibit also a higher administrative literacy.

It is outside the scope of this study to estimate the digital literacy of citizens. A few studies already extensively addressed the digital literacy topic [e.g. 6]. So, hypothesis 1 will be taken as a valid assumption in our study. In this paper we will concentrate on the issues related to the second hypothesis. To the knowledge of the authors, hypothesis 2 has not been yet addressed in the literature.

This paper is organized as follows. First, we give an overview of the processes and data used in the study. We briefly describe the procedures constituting the process for supporting a tender for renting flats to citizens at favourable prices. In section 3 we describe the results obtained from analysing the collected data. The most important findings are summarized and discussed in the conclusions.

1. Tender for renting flats at favourable prices

The data for the analysis described in this paper were collected in a process for renting flats to citizens under favourable terms, conducted by the Housing Fund of the Republic of Slovenia, public fund [7, 8, 9]. One of the Fund's assignments is to construct and rent apartments to citizens at favourable prices. Its strategic goals that support these activities are the following: (1) assuring suitable quality of apartments, (2) assuring larger number of apartments offered to the market, and (3) lowering (or at least stabilizing) the prices of apartments in the real estate market. This assignment turned out to be well received by the general public and consequently attracted considerable media attention.

The business process of renting flats consists of the following six phases. First, the Fund prepares a call that defines eligibility criteria and application requirements for housing rent and publishes it the media and on the Internet. Second, interested applicants fulfil and submit the prescribed paper or electronic form (based on their own preference). Third, received applications are identified and validated by the Fund's officers. Next, all complete applications are ranked according to their priority and allowed to participate in the process of apartments' distribution. Ranking criteria and the rules for rank computation are determined in advance and include attributes like family status, health condition, number of kids, etc. When two or more applicants fall into the same priority rank, random choice as the fifth phase is used to select a single applicant to rent each apartment. In the sixth phase, all the applicants are notified about the outcome of the apartments' distribution sub-process.

Table 1. Number of applications in groups determined by a submission type, application completeness and approval status

Application	Number	Percent [%]
All	614	100,0
Electronic	287	46,7
Electronic, complete	110	17,9
Electronic, complete, approved	83	13,5
Electronic, complete, not approved	27	4,4
Electronic, incomplete	177	28,8
Paper	327	53,3
Paper, complete	268	43,6
Paper, complete, approved	218	35,5
Paper, complete, not approved	50	8,1
Paper, incomplete	59	9,6

To maintain high level of credibility, the supporting information system has to provide transparent and comprehensible insight into all phases of the underlying process. Moreover, it has to incorporate several controlling mechanisms that assure the integrity and confidentiality of the processed data. Besides, flexibility and robustness with respect to changes are also desired qualities of the implemented decision support system. To participate in e-Government infrastructure, the system has to incorporate modules for achieving interoperability with other available services in order to simplify the controlling procedures. These requirements turned out to impose high complexity to the system's design and implementation.

The purpose of our work is to examine the question from hypothesis 2, whether the higher digital literacy required by a person to be using e-services also implies higher administrative literacy? To test the hypothesis, we collected data from the 614

applications for renting flats under favourable prices, which were submitted in the period from February 2013 till March 2014. The collected data were analysed with statistical package R [10]. For submitting an application, each potential applicant (referred to as a client in further text) had two options: (1) submit the application and attached documents through the prepared web interface, or (2) fill the application on a printed form and submit it together with the printed attachments via regular post. 287 clients selected the electronic path through the web interface, while 327 clients decided to use traditional channel to submit an application on paper.

Upon arrival each application was carefully checked by the Fund's officers. If it satisfies all the necessary preconditions imposed by the tender, it is labelled as complete. After certain designated time (typically three weeks) all the complete applications proceed further to the process of approval, while the rest of the applications are labelled as incomplete. In the approval process, all the complete applications are marked as approved or not approved, depending on the final outcome. Table 1 shows numbers and percentages of applications that correspond to a particular group. For example, the numbers in the fourth row indicate that there were 83 completed and approved applications that were submitted electronically. The same information is depicted also in Figure 1.

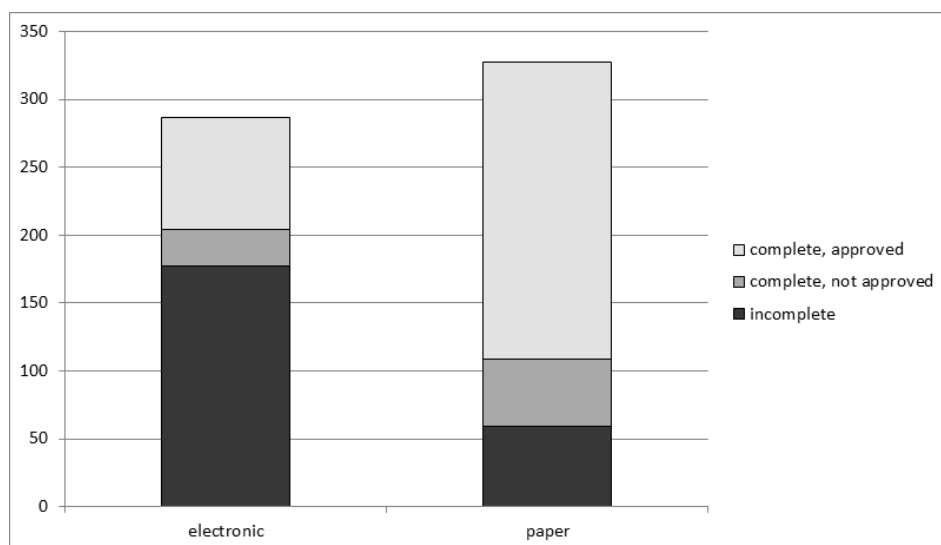


Figure 1. Number of received applications for renting flats segmented by completeness and approval, with respect to electronic or paper submission.

The quality of data gathered from the applications submitted to the tender for renting flats at favourable prices was remarkably high because of the requirements of the whole project. After each of the iterations within the tender, the contracts were signed with the approved applicants. Also, there was evident motivation from the applicant side to fill in the correct and valid data and to provide the required attachments. The number of applications considered in the analysis was sufficient for all practical purposes. Also, each applicant had to deposit 500 EUR as a security deposit for the seriousness of the application; so, the unserious applications were to a great extent evaded.

However, we had no control over the sampling method. All the citizens that wanted to rent a flat from the Fund were in the position to submit an application. Also, they made a choice between electronic and paper submission. The sample therefore represents a population of citizens that share a common interest and whose characteristics might not be identical to the ones from strictly randomly sampled citizen population.

2. Results

The aim of the analysis presented in this paper was to test the hypothesis that digital literacy is positively correlated with administrative literacy. The distribution of the received applications separated into electronic and paper submission is depicted in Figure 2. From the data it follows that the share of completed applications given the paper submissions is 82.0%, which is significantly better than the share of completed applications given the electronic submissions (38.3%).

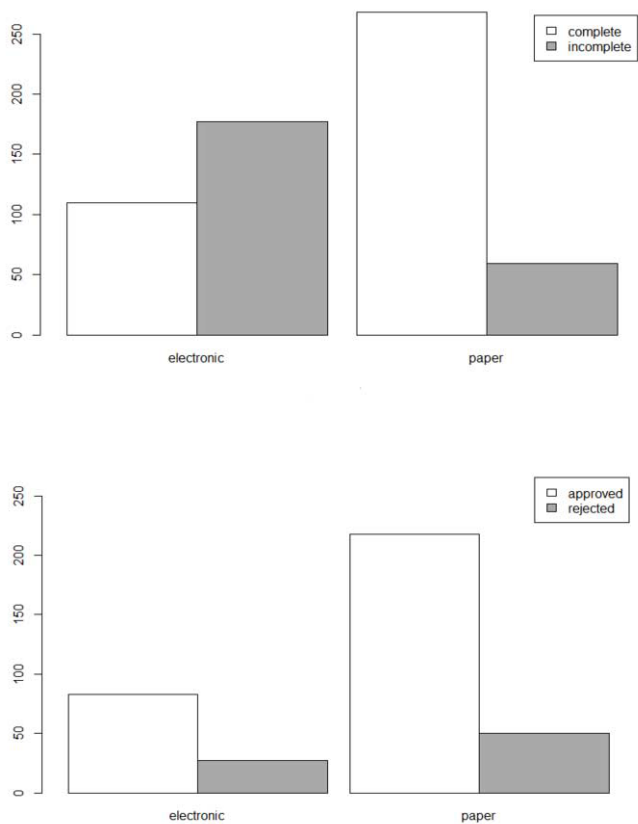


Figure 2. Number of received, complete and approved applications for renting flats according to the chosen submission channel.

Pearson's Chi-squared test with Yates' continuity correction [11] gives p -value $< 2.2e-16$ and χ -squared = 121.1 with one degree of freedom. Note that considering only complete applications before the approval phase, the difference between approved and rejected is not significant given the electronic and paper submission. Here, the share of approved applications given the completed paper submissions is 81.3%, and the share of approved application given the completed electronic submissions is 75.5%. The difference is not significant, since p -value = 0.2499, and χ -squared = 1.324 with one degree of freedom.

Some of the submitted applications were labelled complete upon the arrival, since they satisfied all the necessary preconditions imposed by the tender; for the others that were at the first stage labelled incomplete the applicants were in the predetermined time frame allowed to supply additional data and attachments in order to complete the application. Number of such updates was also recorded for each application. On average, there were 1.62 updates per application, where number 1 means that the application was complete upon the first submission (no updates, just a submission). There were 368 such applications. Maximal number of updates is 6; there is only one application with 6 updates.

In Figure 3 the distribution of the number of updates is shown for various application groups. The labels of groups on x-axis are composed of three parts: (1) el-electronic, paper; (2) comp-complete, incom-incomplete; (3) appr-approved, rej-rejected. Note that the group with the highest mean and mode is the group of applications submitted in electronic form, with the final status of completed and approved (el-com-appr). The modes (most common values) for all other groups are 1, meaning that the majority of applications from other groups were never updated.

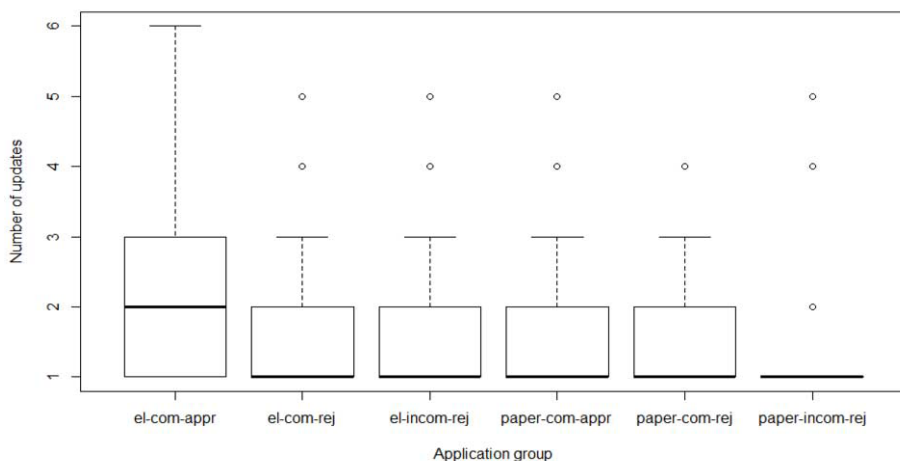


Figure 3. Number of updates required from clients to complete their applications for renting flats for different groups of applications. One update indicates that the application was submitted and never updated.

In Figure 4 priority ranks of applications are shown. Lower numbers denote ranks with higher priority. There is practically no difference between rank distributions of complete approved applications with respect to the submission channel; only the

standard deviation is higher when applications are submitted on paper. When observing the application ranks for the electronic and paper group alone (Figure 4), there is a significant difference between the means of distributions; the mode value, however, is the same for both groups.

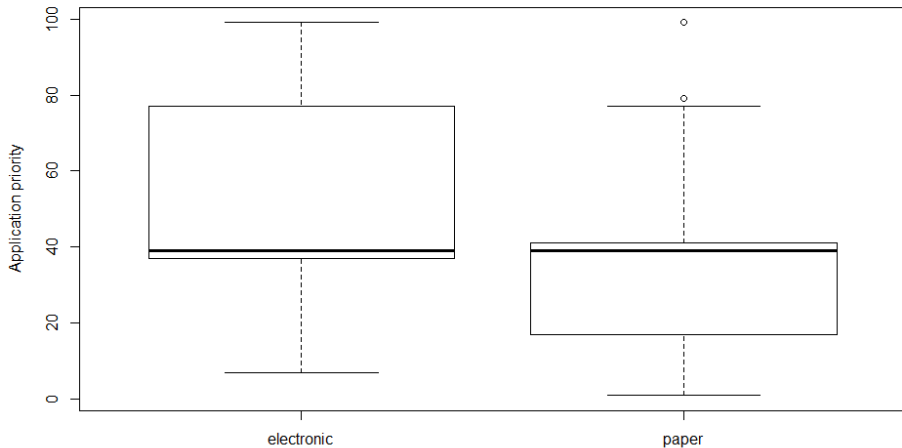


Figure 4. The distribution of priority for groups of applications for renting flats.

The results presented in this section show that the hypothesis 2 can be rejected with high confidence. In our test case the applications that were submitted in electronic form were on average significantly less successful in the further processing than the applications submitted on paper, while the majority of other indicators (like priority rank) were distributed similarly between the two groups. The results therefore indicate that high digital literacy is not sufficient to successfully use e-government services.

However, it should be noted that we tested our hypothesis on a single case. Due to a single case limitation it is also difficult to estimate the influence of other contributing factors. For example, one potential cause might be that the citizens that had used using electronic form had invested less time in making a decision, so they acted irrationally and changed their minds later in the process. Future work should therefore include mechanisms that would help identifying such deviations.

3. Discussion and conclusion

In this paper we addressed the relation between digital literacy and administrative literacy in the context of e-government. For a case study we took a process of a tender for renting flats to citizens under favourable terms, conducted by a state housing fund. The data for the study were collected from 614 applications to the tender and analysed with R [10].

It is a common understanding that citizens' digital literacy has to reach a certain level in order to start successfully using the available e-government services. However,

our results indicate that a high digital literacy is not enough. In some cases it not only ceases to help, but might also degrade the overall performance and success of a citizen using e-government services. While governments strive to minimise digital divide and improve digital literacy of the citizens [6], they should as well invest time and resources to improve administrative literacy of the citizens.

Acknowledgement

The presented work was carried out for the Housing Fund of the Republic of Slovenia, public fund. We wish to thank the Fund's management for their support and cooperation.

References

- [1] UN Global E-government Readiness Report 2005: From E-government to E-inclusion, 2005.
- [2] Capgemini, Rand Europe, IDC, Sogeti and Dti, *Digitizing Public Services in Europe: Putting ambition into action - 9th Benchmark Measurement*, December 2010.
- [3] Å. Grönlund, M. Hatakka, A. Ask, Inclusion in the E-Service Society – Investigating Administrative Literacy Requirements for Using E-Services. *Electronic Government, Lecture Notes in Computer Science* Volume 4656, pp. 216-227, 2007.
- [4] E. Lozanova-Belcheva, The Impact of Information Literacy Education for the Use of E-Government Services: The Role of the Libraries. *Worldwide Commonalities and Challenges in Information Literacy, Research and Practice Communications in Computer and Information Science*, Springer International Publishing, Volume 397, pp. 155-161, 2013.
- [5] eGovernment Factsheet: *Information Society Strategy for 2009-2013*, <http://www.epractice.eu/en/document/288351>, March 2011.
- [6] B. Bunker, *A Summary of International Reports, Research and Case Studies of Digital Literacy*, Knowledge Weavers NZ, NZCS – New Zealand Computer Society, 2010.
- [7] B. Cestnik, A. Kern, H. Modrijan, The Housing Lottery in Slovenia: e-Government Perspective. *Electronic Government, 6th International EGOV Conference, Regensburg, 3.-6.9.2007. Proceedings of ongoing research, project contributions and workshops*. A. Grönlund, H.J. Scholl, M.A. Wimmer (Eds.), Trauner Verlag, Linz, 2007.
- [8] B. Cestnik, A. Kern, H. Modrijan, Semi-automatic Ontology Construction for Improving Comprehension of Legal Documents. In: M.A. Wimmer, H.J. Scholl, and E. Ferro (Eds.) *EGOV 2008, 7th International Conference, Turin, Italy, August 31 - September 5, 2008. Proceedings, Lecture Notes in Computer Science*, Springer, pp. 328-339, 2008.
- [9] A. Kern, B. Cestnik, From social networks to public sector services: a case study of citizen participation in real estate, *Proceedings of CompSysTech*, pp. 267-274, ACM, 2012.
- [10] R Core Team, *R: A language and environment for statistical computing*, R Foundation for Statistical Computing, Vienna, Austria. URL <http://www.R-project.org/>, 2014.
- [11] G.W. Corder, D.I. Foreman, *Nonparametric Statistics for Non-Statisticians: A Step-by-Step Approach*, Wiley, 2009.

This page intentionally left blank

Design, Architecture and Processes

This page intentionally left blank

Enterprise architecture in public ICT procurement in Finland

Juha Lemmetti and Samuli Pekkola

Department of Information Management and Logistics

Tampere University of Technology

Abstract. The use of Enterprise Architecture (EA) as a tool to achieve interoperable information systems and efficient public administration processes has advanced in several countries. In Finland the use of EA in public organizations has been made mandatory in recent years. While the outcomes of the Finnish national enterprise architecture (NEA) cannot be studied yet, we analyzed publicly available requests for proposals (RFP) in order to gain insight on the current state of NEA usage. Our aim was to find out, how the EA methodology is present in the procurement documents. By using a conceptual framework from software architectures we were able to show that while the EA methodology can be used in different roles in the course of public procurement, it is still rarely present.

Keywords. Enterprise Architecture, public procurement, interoperability

Introduction

Currently much of the public talk on public administration focuses on the efficiency of the public sector. This is driven by the economic crisis, socio-economic challenges such as increasing unemployment rate, and globalization. In this context, information technologies are seen as tools to improve public sector efficiency [7].

Enterprise architecture (EA) has been mentioned as a tool for achieving alignment between business operations and ICT systems that support them [14]. Yet the term enterprise architecture lacks a commonly shared definition [14,15]. While it is typically used to describe a holistic view organization, encompassing the business objectives, the term *architecture* itself originates from engineering and technology [34]. This connotes more towards ICT systems and their interoperability.

EA has been proposed to be used also in the public sector [8], [10], [27]. The goal there has often been to improve the efficiency and achieve inter-organizational compatibility [6,7], [11], [13]. This is also the case in Finland, where the use of National Enterprise Architecture (NEA) has been enforced by using legislation. Finland is one of the few countries that have chosen normative usage of Enterprise Architecture [8], while other countries, for example the Netherlands and Norway have chosen a more lenient approach on the usage of EA frameworks [13], [15]

While the rationale behind the usage of EA in the public sector is evident, the outputs and effects of the EA in the public sector require research [8], [13]. In this paper we investigate how the National Enterprise Architecture (NEA) is concretized, i.e. is used in the IS system implementation level. As public ICT procurement is the major means in renewing any public sector ICT we analyze public ICT procurement documents,

particularly requests for proposals. Those were selected as they play an important role in the realization of the benefits gained using the ICT. Implementing EA principles and practices should be first visible in those documents.

In this paper we will thus conduct a content analysis on the requests for proposal documents. We take this narrow starting point to a more generic level by answering following research question: “*how the Finnish national enterprise architecture can be seen in public procurement documents and in which roles or functions the EA methodology or artifacts are used?*”

1. Background

1.1. Enterprise Architecture in the Public Sector

The terms enterprise architecture (EA), national enterprise architecture (NEA) or government architecture (GA) terms are used¹ to describe the design principles that encompass processes, information and information systems used in the public sector [14]. Yet the concepts are ambiguous [13] as there are no generally accepted definitions for terms architecture [34] or enterprise architecture exists [13].

The enterprise architecture covers the organization’s *current* architecture, *future* architecture, and *transition* plan between the phases [1]. Other terms used in this sense are as-is or baseline architecture for the current state and to-be or target architecture for the future state [35]. The architecture descriptions can be divided by the hierarchical level [29], where lower level descriptions add more details. Important term are also *target architecture*, which describes the architecture from organization’s viewpoints [35]. *Reference model* or *reference architecture* on the other hand refers to “an abstract framework for understanding significant relationships among the entities of [an] environment” [25], [27], [35].

Several reasons for use of the EA has been presented. Efficiency of the public sector is a common concern [27], as well as business-IT alignment [9]. Enterprise Architecture has been also seen a possible tool in inter-organizational projects [12]. The setting in the public sector is very much the same, as ICT seen as a tool to achieve delivery of services that require co-operation of multiple offices or public agencies [11]. Interoperability of IT Systems has been used as a rationale for adopting EA methodology in Europe and USA [10]. In the USA, EA has been the chosen approach to interoperability in the Office of Management and Budget [8], [11].

1.2. NEA as a Public Management Reform

In September 2011, Act on the Direction of Public IT Governance came into effect in Finland. The Act mandates² the use of an Enterprise Architecture Framework, which has to be used to describe each public sector organization’s processes. Finnish Government

¹ The usage of terms Enterprise Architecture and Government Architecture is often mixed in e-Government literature. Here we have chosen to use the term Enterprise Architecture, as Government Architecture refers to a particular implementation of EA, namely Enterprise Architecture in Public Administration.

² The mandate is not yet legally binding, i.e. if an organization fails to make its EA descriptions, it won’t face any administrative consequences. In practice the EA description work is currently underway in every major organization.

also presented a proposal for Finnish National Enterprise Architecture (NEA), which is based on the TOGAF9 Framework.

The fact that the use of EA has been mandated by the Ministry of Finance, makes the case special. Previous studies have studied the usage of EA in public sector mainly from voluntary basis [13], [15], [27], with some exceptions [8].

In the case of federal enterprise architecture (FEA) in the USA, the use of FEA was mandated by IS budget requirements, which resulted in different patterns for adoption in the organizations. The patterns ranged from minimal compliance to a holistic transformation of business process management. It was shown that the institutional forces at macro- and micro-level were shaping the way in which FEA was taken into use in an organization [8]. In this setting the National EA can be viewed as an example of a public management reform, as the results bear a strong resemblance to the studies of reforms in the public administration [28].

1.3. Role of Architecture

The Finnish National Enterprise Architecture (NEA) consists of several functions: a methodology for EA descriptions, a set of terms and notations used in those descriptions, and a government architecture (GA) representing high-level decisions that are made in the public government³. Despite this ultimate objective, the documents and their terms are internally inconsistent consequently being a source for confusion [13]. This necessitates a framework for viewing the different roles of the EA.

Yet different frameworks to analyze the roles and uses of enterprise architecture are rare [30], [33], [36]. They are either very abstract, or highly detailed but very narrow focus [3], [24], [30], [36]. Here we thus adopt the conceptualization from software architectures [34].

Smolander et al. characterize software architecture metaphors by their perceptions by different stakeholders. They further suggest various uses for software architecture descriptions [34]. These resemble e.g. the work of Clerc, Lago, and van Vliet [4]. Yet it has been suggested that the EA use differs fundamentally from the use software architecture [30]. This, again, necessitates broader analysis, setting the stones for future work on understanding the EA artefact use.

There are several different groups of stakeholders in EA [23]. Those can be roughly classified as people producing EA artefacts (e.g. architects and projects), people using them (e.g. architects, projects, IT organization, and management), and people facilitating EA artefact production and usage (i.e. management) [23].

On the other hand, information systems bridge different (business) siloes and provide representations of one or more task domains [2]. This is very similar to EA products and services that represent task domains such as decision-making or communication. EA use can thus follow IS use, and be characterized by its domain, level of abstraction, and time orientation [18], [29], [34]. These factors characterize EA use, for example when making decisions about the EA target state. Similarly architectural decisions on each level of abstraction are impacted by the preceding level, and have an impact on the subsequent levels [29], [31]. Within each level and architectural type, EA guides decision-making on several other domains [29].

³ At the time of the writing, only high-level principles exist. The creation of the actual GA is delegated to the ministries.

1.4. Public Procurement

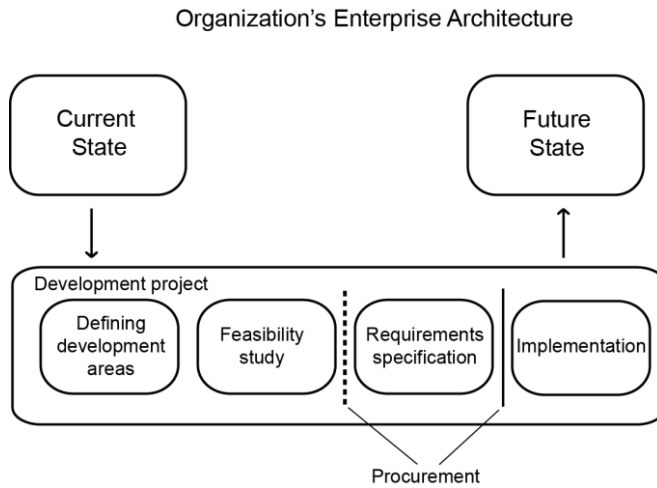


Figure 1. The realization of Enterprise Architecture through procurement.

Public procurement is the process of acquiring goods and services to public organizations [5]. According to legislation in European Union, procurement must be done in a transparent and impartial way in the European single market [5]

Finnish government has published several recommendations on purchasing new information systems. The process follows the classic phases of problem definition, feasibility study, generating of requirement specification, and implementation phase (Figure 1). If any external resources are to be used, the procurement must be done publicly.

The call for tenders in the public procurement must contain enough information for the potential suppliers. Essential part of the call for tender is the requirements specification attached to the call for tender. Research has shown that producing the documentation for the public procurement is a demanding task. It is a difficult task to specify the requirements for an information system in an open bid [20]. The use of Enterprise Architecture has been suggested as a solution for some of the problems as the EA could harmonize information systems and thus reduce the need for producing new documentation for each procurement [22]. The recommendations of the Finnish government also recognize the role of the Enterprise Architecture in the procurement.

2. Research Methods and Data

2.1. Research setting

The Finnish public sector consists mainly of central government and municipalities. Under the central government are ministries, agencies, and regional administration. In Finland, the central governance is called *steering*, and it is divided in three different forms – steering by norms and rules, economic steering, and steering by information [26]. In inter-organizational setting, the process of co-ordination without direct authority, i.e. steering by information, is often called governance [16]. In the case of national enterprise

architecture, all three forms are used. In this research we view the introduction of national enterprise architecture as a public reform. The reform is initiated by the Ministry of Finance and mandated by the Act on the Direction of Public IT Governance.

Researching public management reforms, and its outputs and outcomes, can be tricky [28]. The effects of the reform can be hard to detect, and there is attribution problem – i.e. what has actually caused the seen effect and would it have happened even without the reform [28].

In the case of Finnish national enterprise architecture, the effects are likewise hard to detect. However, the procurement documents allow us to see some of the *outputs* of the reform across the public sector. Our claim is that, as seen in Figure 1, if the enterprise architecture really is used to increase interoperability and inter-organizational co-operation, *it has to be visible in the call for tenders*. This is because the call for tender is the definition and specification of the system to-be-implemented, and a basis for the contract made between the buyer and the supplier. No essential changes can be made to the content, or at least they are not easy to be made [5]

2.2. Research method

The research method used is content analysis [19]. The analytical construct for the research is adapted from the four metaphors for software architecture presented by Smolander et al. [34]. We have taken different roles for software architecture, and looked for the roles in the data and coded the data accordingly. The motivation for using the framework is that it enables consistent approach to reading the documents, which in turn is related to the reliability of the research [19].

The same categorization is used for all the architecture areas – business, data, information systems, and technology. The *literature* metaphor code is used, when there is a description of the current state in the request for proposal. The *decision* code is used when the high-level principles or goals are listed. The *blueprint* code is used, when the request for proposal gives detailed implementation details or instructions for the supplier. The *language* metaphor is not linked to the time or level of detail. In the analysis EA is understood and coded to be used as a language, when the EA terminology or EA methodology is being used to describe the system under procurement. We do not expect that the roles and thus codes are disjoint, or that they are the only roles for enterprise architecture in public procurement.

2.3. Data

The data used in the research was requests for proposals (RFP) from Finnish portal for public procurement, Hilma. The data was sampled during the period of October – November in years 2012 and 2013. The requests for proposals were selected by their CPV-code, in this case the CPV code division 72000000-5.

At the first stage of the analysis the RFPs were filtered based on whether they were fit for the analysis or not. Some tenders had to be discarded because their subject was not an ICT system, or they were e.g. RFPs for purchase framework arrangements or the subject of the purchase was labor. They are thus on about enterprise architectural implementation but either generic frameworks under which detailed procurements may take place, or just outsourcing some labor.

The total number of RFPs gathered was 78, 35 in year 2012 and 43 in year 2013. From those a total of 55 RFPs were analyzed (25 and 30, respectively).

3. Analysis

3.1. Enterprise Architecture as Literature

Smolander et al. describe the literature metaphor as “*documentation of technical structures that aid in transferring knowledge over time*” [34]. This can be seen in calls for tenders in the descriptions of the current processes, data models, information systems, and technologies used.

The Act on the Direction of Public IT Governance states that organizations are responsible for generating the architecture descriptions of their target architectures. If these architecture descriptions exist, they are candidates for inclusion to the request for proposals.

In the RFPs under analysis, some of them included the existing architecture descriptions. In these cases the apparent function of the descriptions were to give information about the organization’s working processes, data, information systems, and technology used in the systems. From the analyzed RFPs it could be seen that a few of the organizations had made the descriptions solely for the procurement under analysis possibly in a requirements specification phase preceding the actual procurement.

As the EA framework is relatively new, only few organizations had the descriptions made in the format given in the national enterprise architecture methodology. The result of this is that the current architecture descriptions usually lack one or more of the architecture areas. Typically information systems and technology architectures are given in more detail but only in few cases the processes or data architectures were described.

3.2. Enterprise Architecture as Blueprint

In the conceptual framework the blueprint represents “*a high-level description of the system, directly guiding more detailed implementation aimed at the production of individual components.*” [34]. In the RFPs this translates to the description of the system under procurement. As the specification of the system is crucial to the procurement [21], this part was present in almost all of the analyzed RFPs.

The requirements for the system under procurement were described using NEA terminology and tools in only a few cases. In most of the cases, the descriptions were made using various notations and methods, and in quite a few cases the requirements were given in the form of excel files listing requirements one by one. In these cases one cannot say that the requirement specification is a high level description of the system, but rather a collection of border conditions the system must fulfill.

In those cases in which EA terminology was used, the advantage was that typically all different architecture areas were addressed. In the other RFPs some of the architecture areas were covered in detail, and the others very superficially. Typically either processes or systems were covered in detail, while technical architecture usually meant the versions of the operating systems and productivity tools and the data architecture was all but non-existent.

In cases where the system under procurement was used in heavily regulated processes, e.g. payrolls or accounting, the description of the system was very superficial. This may be due to the regulation, but also due to the fact that systems used in such a tasks are few in numbers in Finland and they all have the same basic functionality. However, in some cases the same approach were taken in non-regulated systems, which can lead to problems later in the project [20, 21].

3.3. Enterprise Architecture as Decision

The decision metaphor can be described as “*the process and product of decision-making concerning design tactics, strategies and associated resources*” [34]. The high-level decisions should act as steering principles, with which the goals of interoperability and compatibility should be achieved [7], [11]. As this is the actual rationale behind EA framework adoption, it is surprising to find that those decisions cannot be found in the requests for proposals. Only few RFPs included a high-level principles and guidelines of the system. Even the purpose of the system under procurement were absent in some of the RFPs, and only the detailed list of requirements were given.

In the data there were only two cases where the organization had included the organization's EA principles to the RFP. Some organizations had given policy-level principles about processes and technologies, but in most of the cases only the detailed blueprint-level was given. This leads to a situation, where the system under procurement is described only by low-level requirements, and the general purpose and environment is not described at all.

3.4. Enterprise architecture as language

“*The Language metaphor suggests that architecture enables common understanding about the system among stakeholders* [34]”. In the RFPs this metaphor can be seen as architecture descriptions and images that use the terminology and notation given in the NEA documentation.

The terminology was used in 6 RFPs in 2012 (out of 25) and in 5 RFPs in 2013 (out of 30). There is surprisingly little change between years, even though the enterprise architecture work has been carried out for over two years by the end of 2013⁴. Actually, a larger share of the data gathered in the year 2012 used EA notation than in the sample taken in year 2013.

The value of the NEA language can be seen when browsing through the data. When the NEA is not used, the images are typically drawn using some kind of ad hoc notation. When the goal is common understanding, the learning and use of NEA notation might help the parties – the buyer and the supplier – to better come into a conclusion for the contents of the system.

4. Discussion

The RFPs illustrate that the literature and blueprint roles for architecture were the most commonly used. Decision was seen only in a few cases, and language in even fewer requests for proposals. Even though the terminology was seldom used, the concepts of business architecture and systems architecture were prominent in most of the RFPs.

The fact that the high-level policies were absent in the call for tenders is contradicting with the high-level objectives of EA adoption in Finnish government. The high-level objectives are to be achieved through novel usage of information systems. Their procurement is obviously a mandatory step. In this sense, the absence of policy-level architectural principles in the RFPs gives insight of the timeframe, in which the

⁴ The reform was well known in advance, and many agencies started their EA projects even before the Act was finalized and came into effect.

benefits can be realized. On the other hand, some policy-level decisions can be considered as general descriptions for the procurement. For instance, several RFPs specifically asked for web-based implementations, which are known to work in different types of computers and mobile devices.

The reasons behind the absence of EA terminology even two and a half years after the introduction of national enterprise architecture cannot be investigated using the content analysis methodology used in this research. Previous research has identified institutional patterns behind the phenomenon [8] and the immature nature of the EA integration to organizational decision-making [6].

In the few cases where the EA had been used in a language role, the resulting RFP had all the architecture areas covered at least in some detail. Thus, we argue that the EA methodology can be used as a checklist for the details to be included in the RFP. Together with the existing EA definitions (literature) it could make the making of the RFPs simpler and increase the quality of the RFPs.

The data analysis was conducted by using the framework from the software architectures [34]. Different metaphors for architecture were used in the data analysis to analyze different functions of software architecture. The existence of metaphors literature, blueprint, and language in the RFPs were evident. While the language was used in only a few RFPs, it clearly had a role in conveying the desired target state to the potential suppliers. However, the role of decision is more multi-faceted than given in [34]. The decisions may lie in every architecture area, and the decisions are made in different levels of public administration. For example, the changes introduced by the new information system typically cover department-level or organizational issues, while the top-level public reforms may change the whole way of organization. The principles governing the whole public sector are broad and their implications to practice are unclear.

Thus, we argue that in the public procurement context, the division between blueprint and decision does not grasp the different levels of abstraction. When compared to frameworks used in private sector [29], [32], the Finnish public sector has more levels than an enterprise, and the levels are not hierarchical. Typically the governance comes from national level, ministries, agencies, regional councils, municipalities, and municipal joint authorities [28]. While the administrative structures are not identical between countries, the same functions exist in western administrative culture in one form or another [28].

Second, there are major development areas that are invisible to the public procurement. Work done by the public sector's own staff or public companies does not fall under public procurement [5]. The collection of the data was systematic, but there were many major agencies, where there were no RFPs in the data gathering period.

Nevertheless, the amount of RFPs using the EA methodology and terminology was surprisingly low. One obvious explanation would be that the creation of the EA descriptions is currently underway in many organizations and the EA documentation is not ready. On the other hand, a question can be raised whether the low portion of RFPs including EA is related to the normative introduction of the EA. As Hjort-Madsen stated in his research, one of the patterns of adoption is to do the bare minimum work required to comply with the law [8]. The Finnish law dictates the creation of the EA descriptions – not their use in the practical work. This question is left to the further research.

5. Conclusions

The objective of the research was to find out how the Finnish national enterprise architecture reform can be seen in public procurement documents and in which roles or functions the EA methodology or artifacts are used.

Four architecture metaphors from software architectures were used in the research [34]. The EA was used in all four metaphors – blueprint, literature, language, and decision. In the research it was found out that the metaphors are suitable for the analysis of EA roles, but the decision metaphor does not grasp the different ways in which EA is used to describe decisions made in different levels and architecture areas.

When compared to the objectives of the EA reform, the findings are contradictory. Publicly stated objective of the EA reform is to improve efficiency using ICT tools and to achieve ICT system interoperability. However, these viewpoints are all but non-existent in the requests for proposals. If these kind of requirements are introduced after the procurement phase, the results are uncertain and, in most cases, costly. The typical lifespan of the systems under procurement is five to ten years [17], in addition to the time that the implementation and commissioning takes. Therefore we argue that currently the EA reform has not produced any rapid benefits. Neither will it do so in the near future. In order to achieve wide-spread ICT system harmonization or the usage of standard interfaces, the requirements must be set in the procurement documents. Currently they are seldom there.

On the other hand, there are many benefits that the EA methodology can offer to the public procurement of ICT systems. The existing EA documentation gives insight of the organization's processes and ICT systems (literature), it can be used to provide a holistic view of the desired future state (blueprint), and it can act as a common language between purchasing organization and suppliers (language). Perhaps even more importantly, EA descriptions can give crucial information about the benefits sought with the new ICT system (decision). Yet future research need to be made on how the decision-metaphor can be translated to the public administration, whose steering and governance principles differ from the ones used in the private sector.

References

- [1] Bernard, S.: *An Introduction to Enterprise Architecture*, 3rd edn. AuthorHouse (2012)
- [2] Burton-Jones, A., Straub Jr, D. W.: Reconceptualizing system usage: An approach and empirical test. In: *Information Systems Research*, 17(3), pp. 228-246 (2006)
- [3] Boucharas, V., van Steenberghe, M., Jansen, S., Brinkkemper, S.: The contribution of enterprise architecture to the achievement of organizational goals: a review of the evidence. In: *Trends in Enterprise Architecture Research*, pp. 1-15 (2010)
- [4] Clerc, V., Lago, P. van Vliet, H.: The Architect's Mindset. In: *Proceedings of the 3rd International Conference on Quality of Software Architectures*, QoSA2007, pp. 231-249 (2007)
- [5] Directive 2004/18/EC of the European Parliament and of the Council on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts (2004)
- [6] Hiekkanen, K., Korhonen, J. J., Collin, J., Patricio, E., Helenius, M., Mykkanen, J.: Architects' Perceptions on EA Use--An Empirical Study. In: *IEEE 15th Conference on Business Informatics (CBI)*, pp. 292-297 (2013)
- [7] Hjort-Madsen, K.: Enterprise architecture implementation and management: A case study on interoperability. In: *HICSS 2006* (2006)
- [8] Hjort-Madsen, K.: Institutional patterns of enterprise architecture adoption in government. In: *Transforming Government: People, Process and Policy*, vol. 1, pp. 333-349 (2007)

- [9] Gregor, S., Hart, D., Martin, N.: Enterprise architectures: enablers of business strategy and IS/IT alignment in government. In: *Information Technology & People*, 20(2), pp. 96-120 (2007)
- [10] Guijarro, L.: Interoperability frameworks and enterprise architectures in e-government initiatives in Europe and the United States. In: *Gov. Inf. Quarterly* 24, pp. 89-101 (2007)
- [11] Guijarro, L.: ICT standardisation and public procurement in the United States and in the European Union: Influence on e-government deployment. In: *Telecommun. Policy*, vol. 33, pp. 285-295 (2009)
- [12] Janssen, M., Klievink, B.: Can enterprise architectures reduce failure in development projects? In: *Transforming Government: People, Process and Policy*, 6(1), pp. 27-40 (2012)
- [13] Janssen, M., Flak, L.S., Sæbø, Ø.: Government Architecture: Concepts, Use and Impact. In: *Proceedings of 2th IFIP WG 8.5 International Conference*, EGOV 2013 pp. 135-147 (2013)
- [14] Janssen, M., Kuk, G.: A complex adaptive system perspective of enterprise architecture in electronic government. In: *HICSS 06*. (2006)
- [15] Janssen, M., Hjort-Madsen, K.: Analyzing Enterprise Architecture in National Governments: The cases of Denmark and the Netherlands. In: *HICSS 07* (2007)
- [16] Jessop, B.: The rise of governance and the risks of failure: the case of economic development. In: *International Social Science Journal*, vol. 50, pp. 29-45 (1998)
- [17] Kankaanpää, I.: *IT Artefact Renewal: Triggers, Timing and Benefits*. PhD dissertation, Jyväskylä University Printing House, Jyväskylä (2011)
- [18] Kaisler, S.H., Armour, F., Valivullah, M.: Enterprise Architecting: Critical Problems. In: *HICSS 05* (2005)
- [19] Krippendorff, K.: *Content Analysis*, Sage (2013)
- [20] Moe, C., Risvand, A.C., Seing, M.K.: Limits of Public Procurement: Information Systems Acquisition. In: M.A. Wimmer et al. (eds.): *EGOV 2006, LNCS vol. 4084*, pp. 281–292. Springer, Heidelberg (2006).
- [21] Moe, C.E., Päivärinta, T.: Challenges In Information Systems Procurement in the Public Sector In: *Electronic Journal of e-Government* Volume 11 Issue 2 pp. 308-323 (2013)
- [22] NASCIO: Leveraging Enterprise Architecture for Improved IT Procurement (2012) http://www.nascio.org/publications/documents/NASCIO_LeveragingEA_July2012.pdf
- [23] Niemi, E.: Enterprise Architecture Stakeholders - a Holistic View. In: *AMCIS 2007 Proceedings*. (2007)
- [24] Närman, P., Holm, H., Johnson, P., König, J., Chenine, M., Ekstedt, M.: Data accuracy assessment using enterprise architecture. In: *Enterprise Information Systems*, 5(1), pp. 37-58 (2011)
- [25] Reference Architecture Foundation for Service Oriented Architecture Version 1.0, <http://docs.oasis-open.org/soa-rm/soa-ra/v1.0/cs01/soa-ra-v1.0-cs01.pdf>, referenced 1.4.2014 (2012)
- [26] Oulasvirta, L., Ohtonen, J., Stenvall, J.: *Steering of municipal social welfare and health care. How to find a balanced approach*. Publications of the Ministry of Social Affairs and Health, Helsinki (2002)
- [27] Peristera, V., Tarabanis, K.: Towards an enterprise architecture for public administration using a top-down approach. In: *European Journal of Information Systems* vol. 9, 252-260 (2000)
- [28] Pollitt, C., Bouckaert, G.: *Public management reform: A comparative analysis-new public management, governance, and the Neo-Weberian state*. Oxford University Press. (2011)
- [29] Pulkkinen, M.: Systemic management of architectural decisions in enterprise architecture planning. four dimensions and three abstraction levels. In: *HICSS 06*. (2006)
- [30] Purao, S., Martin, R., Robertson, E.: Transforming enterprise architecture models: an artificial ontology view. In: *Advanced Information Systems Engineering*, Springer Berlin Heidelberg, pp. 383-390, (2011)
- [31] van der Raadt, B.: *Enterprise Architecture Coming of Age*. PhD dissertation, SIKS Dissertation series No. 2011-5 (2011)
- [32] Ross, J. W., Weill, P., Robertson, D.C.: *Enterprise Architecture as Strategy: Creating a Foundation for Business Execution*. Harvard Business Press (2006)
- [33] Sidorova, A., Kappelman, L.: Better Business-IT Alignment Through Enterprise Architecture: An Actor-Network Theory Perspective. *Journal of Enterprise Architecture* 7 (1), pp. 39–47 (2011)
- [34] Smolander, K., Rossi, M., Purao, S.: Software architectures: Blueprint, Literature, Language or Decision? *EJIS* 17, pp. 575–588 (2008)
- [35] TOGAF Version 9.1, The Open Group (2011)
- [36] Winter, R., Bucher, T., Fischer, R., Kurpjuweit, S.: Analysis and Application Scenarios for Enterprise Architecture: An Exploratory Study. In: *Journal of Enterprise Architecture* 3 (3), pp. 33–43. (2007)

Semi-Automatic Business Process Modeling for E-Government

Eliane MAALOUF^{a,1}, Maria SOKHN^a, Anne LE CALVE^a and Fabian CRETTON^a

^aUniversity of Applied Sciences of Western Switzerland, Valais-Switzerland

Abstract. Advances in the domain of semantic web technologies have reached the area of business management with the discipline of Semantic Business Process Management. The concepts of Linked Data become interesting to apply on Business Processes to enrich them with information from diverse sources and link them to those sources. The aim of our project is to enhance process modeling of Swiss E-Government public processes by suggesting to the modeler process fragments for auto completion from a semantic repository. Created processes are linked and semantically enriched with ontology concepts related to the domain of cyber administration. This is expected to enhance query results in the repository as well as improve process documentation. We focus on linking the processes to the cyber administration standards.

Keywords. Semantic Business Process Modeling, Linked Business Process Models, E-Government, Process Auto Completion, Process Translation

Introduction

Business Process Management (BPM) is the discipline concerned with business processes optimization. The BPM life cycle is generally divided into four phases: design, deployment/configuration, execution and analysis. Process modeling in the design phase plays a central role in this life cycle. Van der Aalst survey on BPM [1] mentions that the use of a common ontology can help surpass the complexity due to the use of natural language in process models. However, in practice, few process model collections use a common ontology. Therefore, in most cases, semantic annotations still need to be added to process models before being able to use semantic technologies. The European FP6 project SUPER² defined a Semantic Business Process lifecycle to bridge the gap between the process IT world and the Business world. It defined three types of ontologies: Upper Process Ontology, Business Process Modeling Ontology, ontologies of subsets of process modeling notations and aimed at automating the discovery of web-services to configure the processes for execution [2].

In our work, we only focus on the design phase of the process lifecycle and we use Business Process Modeling Notation version 2.0 (BPMN 2.0) that did not exist at the time of SUPER.

¹ Corresponding Author: Research Assistant, University of Applied Sciences of Western Switzerland, Valais-Switzerland; E-mail: eliane.maalouf@hevs.ch.

² <http://www.ip-super.org/content/view/45/69/>

1. Background and Related Work

Cyber administration in Switzerland is starting to take place. Standards like eCH-040 and eCH-0158 recommended the use of BPMN 2.0 to model Swiss administration public processes [3]. The priority project “B1.13”³ is set to create a process repository to ease exchange of knowledge about processes between cantons and municipalities/communes. The study “Semantic Business Process Management for e-Government” [4] concluded that semantic technologies can help fixing the inherent problems related to semantic deficiencies in government documents, inconsistencies of semantic information among different agencies, complex change management activities and poor process management practices. Those problems seem to be more complex in Switzerland given its structure of 26 cantons and multiple municipalities with different degrees of independence in decision making and the use of four different official languages.

We present some of the related works in the areas of interest to set the context of our study. We do not intend to provide a complete state of the art.

BPMN 2.0 provides a graphical representation for the process designers to organize and model their business processes. BPMN graphical objects are divided into three main categories: Flow Objects (Activities, Gateways and Events), Connecting Objects (Sequence Flows) and Swimlanes (Pools and Lanes) [5]. Additionally, BPMN2.0 introduces extension capabilities to Flow Objects and Artifacts to allow process designers to express additional features of process models. [5] Defines a BPMN 2.0 Ontology in Web Ontology Language (OWL) with 85 classes, 178 object properties and 59 data properties. This ontology is used in this project to assert the structural elements of the process model.

Additionally, Linked Data is a set of best practices for publishing and interconnecting structured data on the web. Gao et al. [6] presented BPMN2.0 extension examples to link a process to different views of the Architecture of Information System (ARIS) framework: organization view (roles, participants, entities, etc.), functional view, data view (objects), control view and control/service view.

In order to allow for a Semantic Business Process modeling environment multiple works defined the requirements for such environments. For [2], such environment should add semantic annotations to processes, store semantic processes in a semantic process repository and enable the querying of the repository to discover existing processes or fragments for reuse through auto-completion. [7] Defined organizational ontologies to use for annotating processes (Organizational Structure Ontologies, Organizational Units Ontology, Business Roles Ontology, Business Functions Ontology, Business Resources Ontology, and Business Goals Ontology). Finally, [8] suggests annotating processes with the following perspectives: functional (process type, process area), behavioral (timing of activities), organizational (actor, organization level), informational (exchange process phase) and business process context (process relationship, business context, and goal).

[9] Presents three types of assertions that can be carried out on annotated business processes: Business Process model type assertions to store information on the type of a graphical object; Business Process model structural assertions to store information on how the graphical objects are connected and Business Process model semantic assertions to represent annotations of graphical objects.

³ <http://www.ech-bpm.ch/>

Given the time allocated for this project, missing Swiss organization and domain ontologies cannot be engineered. We favor the use of an annotation schemas similar to the ones presented above combined with the ARIS views annotation model.

To complete our literature review, we mention some works on Auto completion. [10] Suggests completing processes at modeling time with fragments following a defined set of rules: Constraint rules; Event-Condition-Action rules and Dynamic Rules. On the other hand, [11] ranks the retrieved processes from the repository based on similarity between the query and the models retrieved, patterns observed in other users' preferences and implicit user feedback. Finally, Born [12] proposes a weighted average of three auto completion criteria. The criteria are process-context based analysis, pre- and post-condition analysis and non-functional property analysis.

We will base our auto completion algorithm on similarity measures with the process part that was modeled by querying with SPARQL the business process Resource Description Framework (RDF) definition. Context information is also included in the modeling interface to narrow the lookup space. Those annotations will be described later on.

2. Aim and Method

We identified that "Design Science Research Methodology" (DSRM) is an adequate research methodology to create and evaluate IT artifacts intended to solve organizational problems [13]. As defined by [13], DSRM includes the following steps:

- Problem Identification and motivation
- Define the objectives for a solution
- Design and Development
- Demonstration
- Evaluation
- Communication

Given the context of a Swiss E-Government, a common process repository introduces multiple issues. First, multiple languages hinder the sharing of knowledge. Second, communes do not necessarily have a specialized analyst in process modeling. Third, while modeling, the person does not have access to existing models through her modeling tool to lookup processes for reuse. Additionally, processes are labeled with natural language with no consistent vocabulary and finally, documentation of models is limited to explicit information that can be added by the modeler. We argue that semantic web technology and Linked Data help address those issues efficiently.

We target the development of a proof of concept of a semantic process modeling environment on top of a semantic repository containing a set of 50 processes from a local commune. In order to address the issues above, we are implementing multiple functionalities briefly described below Figure 1. At this stage of the work, we are a stage of "Design and Development" of the DSRM.

2.1. Modeling Interface

We evaluated different open source tools for process modeling. We favor the use of the open source code "Signavio Core Components" since it supports BPMN 2.0, offers a

user friendly interface, based on JavaScript and developed plugins can be exported to other open source tools like jBPM⁴ and Activiti⁵.

2.2. RDF Process Representation

In order to assert the model structure and elements, a process model is transformed into an instance of the BPMN 2.0 Ontology using an XSLT transformation file. We keep a copy of the original model in a separate database. For example, we might get the following triples that uniquely identify a process and express its type:

```
bpmnFileNS:sid-ae602356-3fea-4054-abde-6a72aeba08fa      rdf:type
bpmn20base:Process.
bpmnFileNS:sid-ae602356-3fea-4054-abde-6a72aeba08fa      bpmn20base:isExecutable
"false"^^xsd:boolean .
```

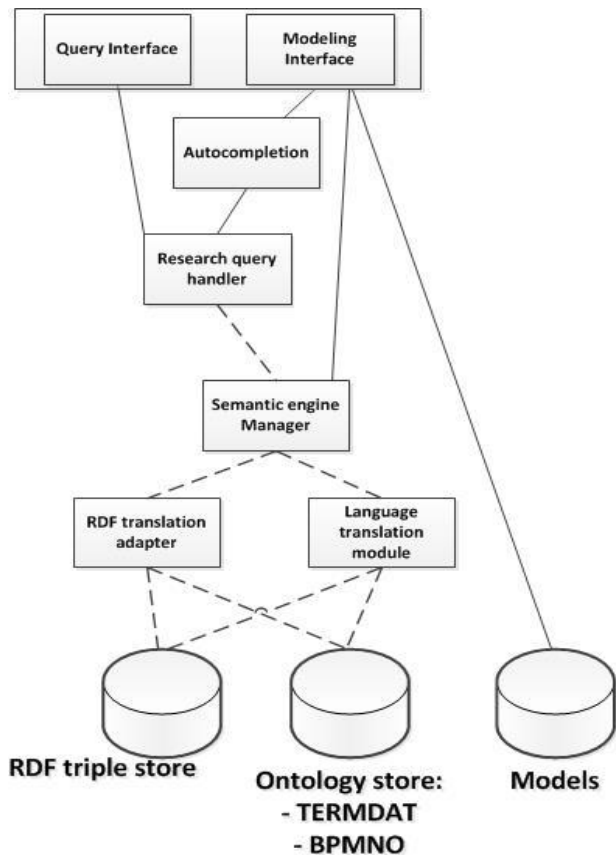


Figure 1. Semantic Modeling Environment Architecture Elements

⁴ <https://www.jboss.org/jbpm>
⁵ <http://activiti.org/>

2.3. Process Auto-Completion

To ease the use of the modeling tool to inexperienced modelers and access existing knowledge in the repository at the modeling time we include process auto-completion functionality. This functionality is being developed as an extension plugin in the modeling environment. When the modeler adds an element in the interface an event is caught and a query is formed to the SPARQL endpoint that will query the structure of the processes for a similar construct. To narrow the query space filtering is done based on annotation elements.

2.4. Process Translation and Vocabulary Management

To overcome the different languages barrier to process exchange we develop a semi-automatic translation function. Only name attributes of elements in the XML BPMN file are the strings to translate from German to French. We aim to offer an initial help to the modeler in the translation. The responsibility falls back on the human to confirm that the tool expressed correctly the concept in the destination language. In order to enable translation, we form a dictionary in RDF from a subset of the multilingual terminology database TERMDAT⁶, a database for recording Swiss legal and administrative terminology. Then we populate GATE⁷ Gazetteers with the dictionary concepts. When a BPMN file is run against the Gazetteer, GATE finds matches in the text and links them to the dictionary concepts. If no match is found, or only partial matches are found, a web translation API is called to provide suggestions for translation.

We favored the construction of the dictionary with TERMDAT since the e-CH 0158 standard [3] recommends the use of a standardized vocabulary and advised the use of this terminology database. To implement this recommendation furthermore and to ensure the use of a standard vocabulary, we modify the modeling tool to allow the suggestion of words from the dictionary to label process elements and annotations.

2.5. Linking Processes

In many systems that we evaluated, a process model is used separately from the rest of the process models in the repository and it needs to contain all the information necessary for its management and use. We argue that context information can enrich a process and enhance its documentation. For this, multiple annotation types were defined by business analysts to annotate the business processes in the public administration process repository. We mention for example, linked to the ARIS views mentioned earlier: process type (functional view), total time (functional view), owner (organizational view), required documents (data view). Furthermore, two required annotation types can be linked to an external existing ontology: mission id and service id. More precisely, the eCH association emitted eCH-070, a standard listing the administration services [3]. This standard was transformed into an ontology and is published under <http://logd.ch/voc/service.html>. For missions, there is a similar standard that is not published yet for which an internal ontology was developed and will be linked to the processes in our proof of concept.

⁶ <http://www.bk.admin.ch/themen/sprachen/00083/00854/index.html?lang=en>

⁷ <https://gate.ac.uk/>

2.6. Repository Querying

Queries are based on SPARQL and are addressed to the triples store. A subset of the queries being implemented is: lookup a match of a label in the repository (results include equivalent match in multiple languages), lookup based on a graphical input query, lookup for processes that start with an event E1 and followed by Activity A1, lookup all processes owned/executed/published by a person/role/entity, lookup for all processes that include a given fragment or sub process, lookup all processes that include interaction between two named participants, lookup all process related to a given service/mission, lookup all process written in a given language.

3. Preliminary Results

In order to showcase the potential of Linked Data with business processes, a set of electronic cyber-administration processes (e.g., eService suivi patrouilles) were annotated with information about the commune that offers it (e.g., Fribourg), the standard to which it is related (e.g., 400-10-012-006), the development language with which it was developed (e.g., Java). Then a visualization of this database was done using Linkurious⁸ as depicted in Figure 2. Such visualization is interesting in the case of a process repository where we try to make sense of the processes' relations between each other and their relations to the standards that regulate them.

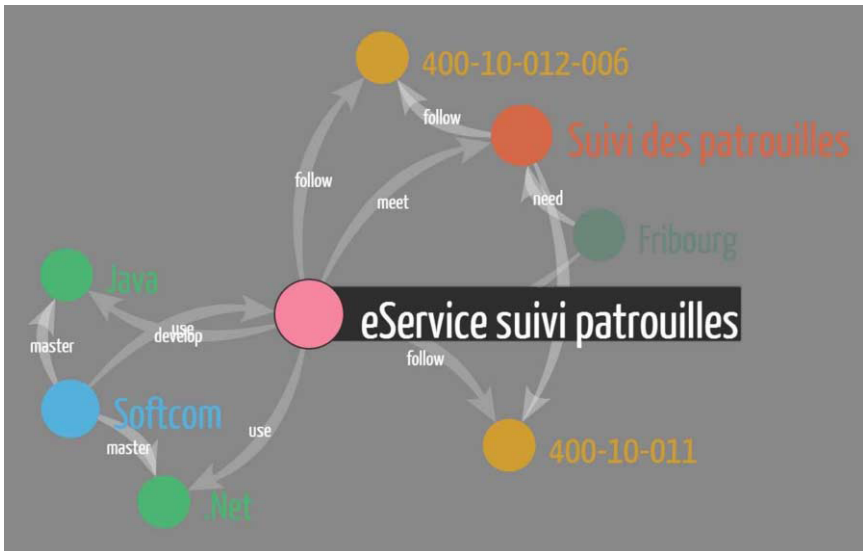


Figure 2. A Process and its Relations

⁸ <http://linkurio.us/>

4. Conclusion and Future Work

Based on the state of the art and existing work in the domain, semantic technologies are bringing multiple benefits in business process modeling and management. In this paper, we presented an ongoing research toward the implementation of a semantic modeling tool for the Swiss E-Government process models. We aim to use Linked Data practices to enhance process documentation and management as well as auto-completion models to ease the use of the modeling language. A semi-automatic translation approach will ease the comprehension and communication of processes between the communes.

Following the DSRM we are following the design and implementation based on a demonstration scenario, then we will proceed to the demonstration of the tool to business analysts and evaluate its usability and usefulness. The current stage of the development is working on the interfaces, to integrate the modules of auto-completion and the translation interface. In parallel, the translation module is being developed and dictionary management is being set. The results that will come out of the first tests will be compared to graph based techniques currently used in modeling tools. Links to more data sources will be prepared, especially to link participants in processes to ontology instances in Friend Of A Friend (FOAF) ontology for example.

References

- [1] W. M. P. Van der Aalst, *Business Process Management: A Comprehensive Survey*, ISRN Software Engineering, Volume 2013 (2013), Article ID 507984.
- [2] M. Dimitrov, A. Simov, S. Stein & M. Konstantinov, *A BPMO Based Semantic Business Process Modelling Environment*, Proceedings: CEUR Workshop, volume 251 (2007)
- [3] eCH E-Government Standards, <http://www.ech.ch/vechweb/page?p=categoryList&site=/documents/Standards/nach%20Nummer>.
- [4] Z. Liu, A. Le Calvé, F. Cretton, F. Evéquo & E. Mugellini, *Semantic Business Process Management for e-Government*, Proceedings: IADIS International Conference on WWW/Internet (2013), 259-267.
- [5] C. Nateschläger-Carpella, *Extending BPMN with Deontic Logic*, PhD thesis book (2013)
- [6] F. Gao, W. Derguech & M. Zaremba, *Extending BPMN 2.0 to Enable Links between Process Models and ARIS Views Modeled with Linked Data*, Springer LNBI: Business Information Systems Workshops (2011), volume 97, 41-52.
- [7] A. Filipowska, M. Kaczmarek, M. Kowalkiewicz, I. Markovic & X. Zhou, *Organizational ontologies to support semantic business process management*, Proceedings: SBPM '09 Proceedings of the 4th International Workshop on Semantic Business Process Management (2009), 35-42.
- [8] E. Mutri & P. Johannesson, *A context-based process semantic annotation model for a process model repository*, Journal: Business Process Management Journal (2013), volume 19(3), 404-430.
- [9] C. Di Francescomarino, C. Ghidini, M. Rospocher, L. Serafini & P. Tonella, *Semantically-Aided Business Process Modeling*, The Semantic Web - ISWC 2009 (2009), volume 5823, Springer Berlin Heidelberg, 114-129.
- [10] T. Hornung, A. Koschmider & A. Oberweis, *Rule-based Autocompletion of Business Process Models*, CAiSE Forum. Vol. 247 (2007).
- [11] A. Koschmider & A. Oberweis, *Designing business processes with a recommendation-based editor*. Handbook on Business Process Management 1(2010), Springer Berlin Heidelberg, 299-312.
- [12] M. Born, C. Brelage, I. Markovic, D. Pfeiffer & I. Weber, *Auto-completion for executable business process models*, Business Process Management Workshops (2009) Springer Berlin Heidelberg.
- [13] K. Peffers, T. Tuunanen, M.A. Rothenberger & S. Chatterjee, *A Design Science Research Methodology for Information Systems Research*, Journal of Management Information Systems (2007/2008), Vol.24, No.3, 45-77.

Testing Communicability in Public e-Services – Process and Outcomes

Marie-Therese CHRISTIANSSON^{a,1} and Malin WIK^a

^a *Information Systems, Karlstad Business School, Karlstad University, Sweden*

Abstract. In this paper, a case of testing public e-Service communicability is analysed in terms of process as well as outcomes. Key elements in test processes are defined, together with the meaning of communicability identified in terms of information-oriented metrics. The purpose of our paper is to develop knowledge about how e-Service providers should improve their ability to communicate and support users in finding, understanding and using e-Services. The reconstructed test process design is based of an analysis of gaze replays in citizen test sessions by means of eyetracking technology. Empirical findings on communicability metrics are further grounded in theory. Our main contribution to the research community and the field of practice, are a test process and a communicability framework to support the assessing of e-Service information. The use of wireframes for the e-Service five layers, together with a multifunctional template for data collection, analysis and presentation are introduced.

Keywords. Communicability, Information-oriented metrics, Test process, e-Service layers

Introduction

The basis of the elaboration on design and outcomes in this paper is a study involving the reconstruction of a user test process with citizens in a municipality. Our aim is to increase knowledge of how to improve the communication of public e-Services, i.e. to provide information content in the e-Service solution to support users' finding, understanding and using the e-Service. Many governmental agendas have been focused on providing many e-Services, customization and making the website attractive. When front-end services are aligned with the back-end business processes, and systems with internal as well as external actors, changes occur in the overall service [1]. However, the instant access to services has to be balanced against more complex websites to navigate in the e-Service use, which might be the results of customization and multiple channels. To be a professional e-Service provider, the task is not only to develop new e-Services, but also to keep the existing services on the websites and to provide an *information content* for communicating e-Services in order to support the users' ability to find, understand and use the service provided [2]. Evaluation based on communicability; i.e. to reflect on purpose, roles involved, business context, action modes and intentional message exchange [2] includes usability issues; i.e. to reflect on the e-Service ability to support user performance, in the way that is expected by the

¹ Corresponding Author: Karlstad University, SE-651 88, Karlstad, marie-therese.christiansson@kau.se

user, without hindrance, hesitation or questions [3] and a system that is efficient, easy to learn and remember, secure to use and difficult to do wrong [4]. In usability testing, the end user evaluates the usefulness of a particular IT solution, most often on systems, with which the user interacts. The focus is on ascertaining if the system meets specific usability criteria [3] to identify problems, which arise when using the systems [4]. Communicability includes usability as well as interactability, actability, visibility and simultaneity issues [c.f. 2, 10]. Our focus is on the ability to inform the user of the e-Service and instruct in the e-Service use, i.e. to inform e-Service users. *The purpose of this paper is to develop a test process with outcomes aimed at supporting e-Service providers' ability to communicate e-Services.*

In the following, we reflect on what matters in finding, understanding and using services in the Swedish municipality case by analysing user reactions and performance in e-Service use. Our research is based on a repeated case study with two user tests (one conducted in 2012 and another in 2013). By considering the test process and its outcomes, insights and lessons learned were inductively achieved. The acquired knowledge was then related to previous research to base our findings on a theory and empirical grounding. In our case, the normative statements on what matters when communicating e-Services based on a reflective analysis of conducted user tests must be tested against previous theory in a validation process. With this deductive approach, we will be able to narrow down our findings to some metrics for communicability in public e-Service solutions. Thus, our case study will generate useful contribution to the local practice (Karlstad municipality), the general practice (organisations with e-Services) as well as scholars in the field of e-Service development and test. As our findings will be interrelated, the study will in particular contribute to the professional practice of communicating and testing e-Services. We will provide practical guidance, as suggested by, for example, Heeks and Bailur [5] as well as Goldkuhl [6].

In the following, communicability in public e-Services is first discussed. In the next section, the research design and our empirical case are described and then the test process as well as outcomes is elaborated on. Our inductive reflections and lessons learned are discussed and related to theory. In the concluding section of the paper, we summarise the contributions.

1. Communicability in Public e-Services

e-Service development requires multiple competence including business process improvements [1], website communication and design [10], open innovation possibilities [7], collaboration with citizens [8] and service design enhancing public value and trust [9]. Communicability has a characteristic intersection and is important in each one of the interactive design areas [10]. The authors [10:227] define the concept as “*A qualitative communication between the user and the interactive system... to which an interactive system successfully conveys its functionality to the user*”. However, there are more software metrics presented by Pressman [11], which might be relevant to relate to communicability, besides the function-aimed. Additional views are quality-aimed metrics (user need, expectations and response on how to satisfy the need) and person-aimed (the users point of view of effectiveness). To understand the quality of e-Services and thus the meaning of communicability, different knowledge areas are important, e.g. organisation, IT and service [2] as well as a social, political and a legal base [20]. In our study we focus on the information-

oriented metrics in a public e-Service setting. Xu et al. [13] have examined system quality, information quality and service quality in an integrated model for a commercial e-Service setting. The result of their study shows that high information and system quality (limited to the information-receiving stage of information regarding e-Service provider, product and/or advice) directly or indirectly improved the e-Service context. Thus, information tends to be an important element in the service delivery.

Rodriguez et al.'s [14] survey on municipality websites stresses the government as the provider of services, information, transparency and interactive communication. In our view of e-Service solutions all those elements work together in the website as a channel transforming the business interaction in a digitalised mode. Further, the user is viewed as a co-producer in the service delivery, as the service per se becomes real in action with the customer (e.g., citizens) [15]. Despite different views on e-Services (e.g., user as a subject compared with a co-producer), scope (websites compared with the web channel) and focus (e-Governance quality compared with e-Service quality), some of the 152 aspects sorted in 23 categories with statements to fulfil seven metrics (components) used in Rodriguez et al. [14] are found to be relevant in our case and focus on informing the user. Additionally, Iskender and Özkan [20] findings are included in Table 1 summarizing our brief literature review on what matters when communicating e-Services, i.e. to inform the user.

Table 1. Communicability in the e-Service context

To find the e-Service	e-Service purpose/goals/role with a match to expectations [2] Service catalogue with e-Service offerings [2], administrative transactions [14] e-Service business process and its prerequisites [2] Multiple channels for service delivery [2] Main menu including not more than 12 options in the same category [14] Menu images must include text, menu options are representatives [14] Link lists are organized by categories and indicated with the screen hand pointer appearing when indicated with the screen arrow [14] The web site includes search/advanced search option, help area, site's use polls, local government's actions and decisions polls, contact us/email form, site map, e-newsletter, suggestions/complaints (e-Service), chat room, forums, FAQ, print out options [14] Time of accessing the intended information - if users are not able to access information on a website in one to two minutes, then the user thinks it is not worth trying [10] Personalization, relevance and security [20]
To understand the e-Service	Actors and roles in the social relation [2] Business context [2] Legal issues, the form/site shows the local government's regulations [14] Valuable actions with a match to intention [2] The forms clearly differentiate the mandatory form field, the form data are validated with clear messages, offers on line transactions, close questions as frequently as possible, include elements directly related with the expected options [14] Sufficient information, affordance, guidance and consistency [2], ease of understanding and completeness [20] Meaning of abbreviations, organized by categories, technical words are

	explained [14] An icon to see more information [14]
To use the e-Service	Action repertoire [2] Results with significant value in use [2], trust in performance [9]

Variations of elements in communicability regarding usability, e.g. perception, navigation, use of icons/symbols and language style for channel choices depends on both context and culture [12]. In this paper the discussions on preferable placement of e-Services; search patterns and the citizens' ability to navigate are excluded.

2. Research Design

2.1. Data collection

The Swedish municipality case consists of user tests performed by citizens partaking in a university course. Test sessions (totalling 71 different users) were conducted on e-Services (totalling 11 different services) in a standard portal provided by one supplier [16]. A majority of the e-Services included in the standard portal test environment were aimed at elderly users, or users with specific life experiences such as having children or house ownership. Therefore, the selection of e-Services was based on the services that can be reasonably understood by our sample (i.e. young students ages 19-23) and by taking use scenarios into account. The scenarios were created and tested by students in another university course for the purpose of finding suitable e-Services with a young target group, and thus e-Services relevant to our users. An example of one scenario (translated from Swedish):

"Your child has finally got a place at a nursery school so now you want to pay your fee as smoothly as possible to the municipality, preferably through a standing automatically order. You decide to investigate this possibility via the municipal website."

Our scenarios were formulated without keywords that could give away the name of the intended e-Service. Giving the user a scenario-based task to perform will alter the way he or she looks at the website, but as Pernice and Nielsen argue [17:148]: *"The main reason to base usability tests on tasks is that this best mirrors the way people actually use the Web: there's a reason you visit a website."* Thus, the scenarios used in our test contained a reason for our users to use a particular e-Service; the user interpreted the matter based on the scenario, thus made the selection of a potential e-Service.

During the test (17 Dec. 2012) the user was asked to *find*² one of the selected e-Service from *the e-Service start-page* (the test environment), *use it* and *determine case status and expected turnaround time* (case handling time). A second task (18 Dec. 2012) was to *navigate from the municipality home page*³ to *find* the requested e-Service, to be able to *describe its purpose* and *expected turnaround time*. During the second test (16-17 Dec. 2013, 7 Jan. 2014) the user was directed to a scenario, to

² Using the search function was not allowed due to technical limitations of the e-Service test environment.

³ A new website launched in October 2012, www.karlstad.se

interpret the task and to *find*⁴ an e-Service to handle the errand from *the e-Service start-page* (the test environment) and *use* it.

Seeing exactly what the user sees, acts, and says helps in understanding why users have problems finding e-Services, and performing and completing their task. In this study, we used the Tobii technology 1750 eye tracker [19] as a data collection tool to capture and record eye movements as well as the real time dialogue between the user, observers and test administrator. The focus was on the comments, actions/non actions of citizens regarding overall aspects of the service provider's ability to communicate e-Services, i.e. to explore and further develop the meaning of communicability.

During the test sessions the users were encouraged to "think aloud", meaning that the users verbalized their thoughts, actions, confusions and frustrations [3]. There are some disadvantages of this technique: the user can interpret it as unnatural and obtrusive [3]; or it may affect the interaction and scan paths of the user [17]. Nonetheless, the users' comments were found highly valuable during our analysis.

The eye tracking data from our test sessions can be visualised in various ways. The gaze replay is a recording of the screen overlaid with the user's eye movements. It is similar to gaze plots, which are still images that show the point where users fixate their eyes and in what order (see Figure 1). However, the latter visualisation does not account for dynamic elements and therefore this and other visualisations were not used in our analysis.

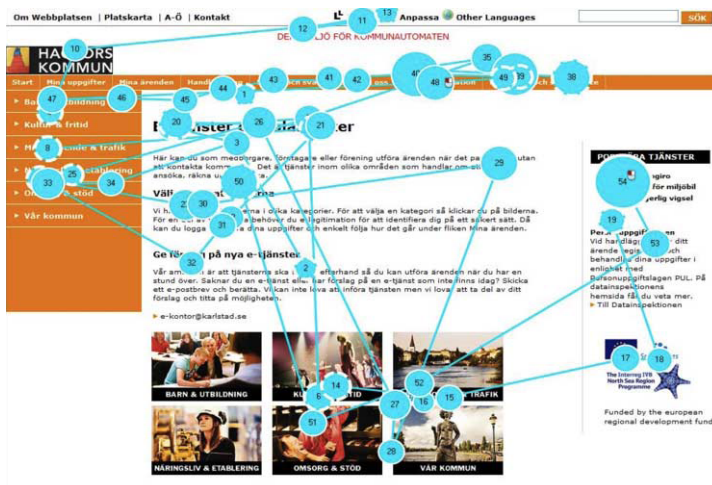


Figure 1. A Gaze plot - showing one user searching for the e-Service "Apply for Direct Debit"

2.2. Analysis

One drawback of using the eye tracking technique is that studies result in large amount of data to handle. Extracting results and interpreting the eye tracking data are labour intensive as well as difficult [17] [18]. Furthermore, a quick scan of the reported

⁴ If the user used the search function, it was noted and the search queries/terms were collected.

studies of the supplier Tobii Technology [19] website, shows no explicit method for efficient elicitation of test results from gaze replay. However, we used the eyetracking technique because it does provide valuable data to analyse, such as how efficiently a user searches for an element and indications of a user's difficulty to extract information from an element and importance of the element [18]. Eye-movement analysis is valuable as it affords seeing what the users do, react on and act upon, not only what they say they have done (which is not always consistent). This technique allows us to see gradations in actions taken (and not taken).

For the best analytical results, Pernice and Nielsen [17] recommend a gaze replay analysis with approximately six users to be able to draw correct conclusions on usability.⁵ Regarding communicability, no conclusions can be drawn whether and what users understand by what they have seen or not seen. However, comments from users and insights into viewed gazes and search patterns, failed actions, action modes (status in errands) and problems arising in the finding, understanding and using of the e-Service can be observed. No diagnoses have been made of problem causes; instead user expressions and ability to perform, and hindrance, hesitation, questions and mistakes in handling are observed. To be able to draw conclusions of communicability we should have asked a wide range of users in different target groups. However, we found a pattern of practical meaning for our young users based on the gaze replays.

In 2012 log notes with empirical data from the visualisations and recorded user voices were collected and structured by each researcher based on our two background references, a human-computer-interaction lens and a social interaction lens in information systems development. In a second run we merged our observations into an analysis protocol. The protocol was then used when we structured our findings into the characteristics of communicability. One challenge in 2013 was to design a more effective handling of the extensive data results from observing the gaze replays. We therefore developed a web-based template to help us to structure log notes and at the same time analyse the material faster by means of the tool Survey & Report used by the university. We had to reconstruct our analysis from 2012 (which step and in what order according to the gaze replay) to develop a useful observation template as a basis for the survey. Another challenge was to know what to call levels and elements in the e-Service in our analysis; comments on the website, the e-Services start page, the focal e-Service start page and steps in performance, placement on the user interface etc. In this study we therefore used the wireframe approach which is a commonly used framework when outlining the structure of the content on a website, without focusing on details of the design [4]. See example in Figure 2 of a wireframe used to be able to map our comments on where user problem occurred, information was missing, user areas neglected etc. The areas in the frame representing the municipality website link (1), the municipality logo (2), the search area (3), the global navigation bar (4), the left menu/main categories (5), the contextual content (6), test environment specific information (6b), drop-down menus: e-Service categories (7), e-Service name (7.1), information sign/icon (7.2), link to e-Service (7.3), link to form (7.4), the right menu/shortcuts (8), information in text (9), footer (10).

⁵ Five users are required for qualitative think-out-loud results.

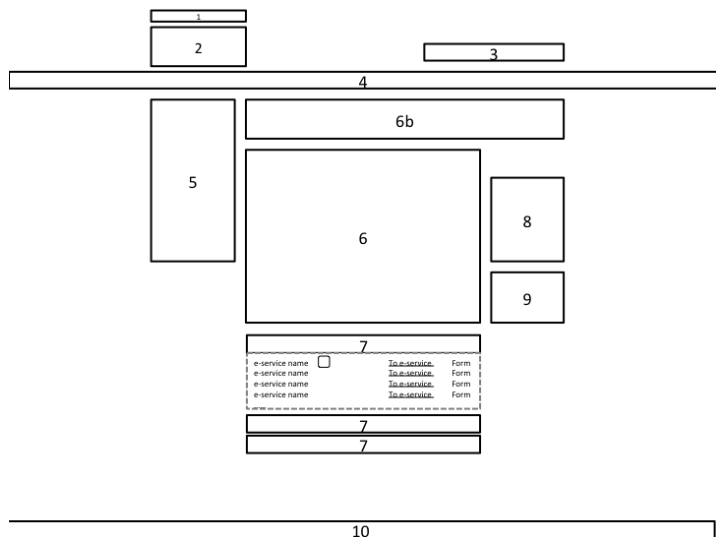


Figure 2. The structure on the focal area e-Service page

When working with wireframes in the analysis, we discovered a new challenge in handling multiple layers in an e-Service, which resulted in five wireframes. The observation template was improved and redefined four times to reach a maturity that would work for data collection, analysis and presentation of results. The major revision of the template was a result of the expanded use of wireframes.

Later in our template development, successful completion criteria (SCC) enable measuring how and if a user has successfully completed the task [3]. In our case we asked the municipality as to provide some SCC to test how their expectations were met. However, they had not yet formed an opinion on this, so instead we asked our users about their thoughts and expectations, based on the scenario. In our analysis we have only noted deviations in user experience: hence, only the behavior of users in compliance with expected use is included. Screenshots have been acting as “the expected” and define our wireframes. Our web-based template has speeded up the analysis from 90 minutes to 24 minutes per user test, because we have learnt from the previous analysis and a more mature communicability concept has been developed. The multifunctional template (to collect, analyse and report) is a result that will benefit further gaze replay analysis in education and research as well as practitioners working with gaze replays. In order to validate the use of the template without pre knowledge of communicability, a student working on his Bachelor thesis, has been testing it on 12 recorded gaze replays from the same user tests on two random selected e-Services. However, a further elaboration on the multifunctional template is beyond the scope of this paper.

3. e-Service User Tests

Our test sessions showed that it was difficult for some users to get adequate information to understand the e-Service purpose, how the service works and what to be expected in the service delivery. Moreover, the users were expecting ‘status’ in direct

relation to the performed service and were not always reading, thus not taking action when instructed to take note of something. According to our analysis of search patterns some users found the e-Service a natural, quick and easily accomplished case while others experienced the same e-Service as messy and difficult, with frustration and a feeling of jumping from page to page, each distinguished by a different appearance, language and form. For a more comprehensive report, confer Christiansson [2] and Christiansson and Wik [21].

Lessons learned from our user tests and the reconstructed and further improved test process are summarised as follows:

- Actions in the user test should start with identifying the pre-conditions for test; the trigger is at best a test request from the stakeholder with SCC and their expectations.
- Selection of specified e-Services to be tested should be conducted based on the user target group, in our case young citizens.
- In preparation of the test sessions, an observation template based on 'communicability' should give directions and support in the data collection during the conducted test sessions to generate useful log notes. Roles in the test sessions should be assigned (e.g. a test administrator, a test moderator and observers).
- Resources in the test process, as identified in our case, were the e-Service portal in the supplier test environment and the municipality home page as the point of departure.
- To conduct the test session an eye tracker might be required together with a recorder and a web cam, or similar tests could be conducted with other techniques without the possibility to elicit information on what elements in the website and e-Service the user saw or did not see.
- Introduce a scenario and let the users elaborate on their thoughts and expectations on the concept of 'e-Service', actions required, results and handling time (to be able to compare with test results).
- In order to increase the quality of analysis, include a web-based template with the approach to note deviations (according to wireframes) in user's ability to find, understand and use the e-Service.
- Pre-marked areas of interest (AOI) in wireframes were useful to analyse the information provided in the e-Service, i.e. (in our case) if the users keep their eyes on a fixed point or limited area and the transitions between AOIs (looks) or several fixed points in one limited area (reading) or if they act on the information (clicking/writing).
- Wireframes are needed at all levels of the website and the use of e-Service. In our case wireframes showing five levels were used in the data collection, analysis and visualisation of results: the municipality home page, the e-Services start page, the e-Service focal area page, the focal e-Service page and the appointed e-Service.

4. Conclusions: Process and Outcomes

The purpose of this paper is to develop a test process with outcomes aimed to support e-Service providers' ability to communicate e-Services. The test process design recommended for similar and repeated tests on communicability in public e-Services is presented in Figure 3.

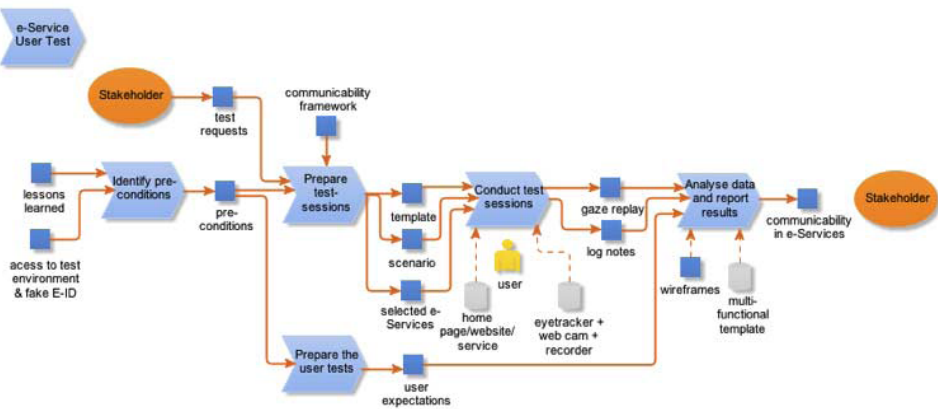


Figure 3. A test process for user tests on public e-Services

Information-oriented metrics, validated in our condensed literature review and lessons learned from conducted user tests, are presented in the communicability framework, see Table 2. The framework can be used in observations and analysis to support assessing e-Service information content in relation to the e-Service information layers in the web channel. Complementary techniques, besides eye tracking and gaze replays, to use in data collections and analysis are illustrated with following abbreviations, (R): Recorded voice - the user talk out loud, (I): Interview and (SC): Screen shot analysis.

Table 2. Elements and information-oriented metrics in the communicability framework

Elements	Information-oriented metrics in e-Service context
Purpose	Explicit intention and value? (SC) (R) Explicit target group? (SC)
Context	Best placement according to business context/case handling/problem to solve? (SC) (R)
Interaction	Explicit roles in the service performance? (SC) (R) Understandable intentions of message exchange? (R)
Actor	Explicit service provider? (SC) Explicit user and role (customer/citizens/co-producer)? (SC)
Action	Relevant actions provided? (R) Support of how service is working? (R) Explicit prerequisites and legal conditions for using/completing the service? (R) (SC) Support of service performance – in a confidence manner? (R)
Content	Comprehensive overview? (R) Relevant and sufficient instructions? (R) Understandable messages? (R)
Result	Handling time (I) (R) Expected results, when and how this is going to be delivered? (I) (R) (SC)

Our multifunctional template will be further elaborated on in terms of the e-Service concept. Additionally, a further development of the communicability framework is necessary. We would like to encourage other researchers and practitioners to use the framework to develop it in appropriate directions. At the same time, we would like to learn from other user tests on public e-Services and look forward to more case studies in this area.

References

- [1] Corradini F, Falcioni D, Polini A, Polzonetti A, Re B. Designing quality business processes for e-government digital services, in Wimmer M et al (Eds.) EGOV 2010, LNCS 6228, (2010), 424-435, Springer, Berlin.
- [2] Christiansson, M-T. Improving Citizens' Ability to Find, Understand and Use e-Services: Communicating the Social Interaction Dimension, *Systems, Signs & Actions* 7 (2013), 177-204.
- [3] Rubin, J. Chisnell, D. *Handbook of usability testing: how to plan, design, and conduct effective tests*, Indianapolis, Wiley Pub, 2008.
- [4] Benyon, D. *Designing interactive systems: a comprehensive guide to HCI, UX and interaction design*. Third Edition. Harlow: Pearson Education Limited, 2014.
- [5] Heeks, R. Bailur, S. Analyzing e-government research: Perspectives, philosophies, theories, methods, and practice, *Government Information Quarterly* 24 (2007), 243-265.
- [6] Goldkuhl, G. Generic regulation model: the evolution of a practical theory for e-government, *Transforming Government: People, Process and Policy* 5 (2011), 249-267.
- [7] Feller J, Finnegan P, Nilsson O. Open innovation and public administration: Transformational typologies and business model impacts, *European Journal of Information Systems* 20 (2011), 358-374.
- [8] Millard J. Are you being served? Transforming e-government through service personalisation, *International Journal of Electronic Government Research* 7 (2011), 1-18.
- [9] Lee, A. Levy, Y. The effect of information quality on trust in e-government systems' transformation, *Transforming Government: People, Process and Policy* 8 (2014), 76-100.
- [10] Cipolla-Ficarra, V. F, Nicol, E. Cipolla Ficarra, M. Communicability Era: New Professionals for Interactive Systems In: Cipolla-Ficarra, V. F. (Ed.) *Quality and Communicability for Interactive Hypermedia Systems: Concepts and Practices for Design*, Information Science Reference, Hersey, New York, 2010.
- [11] Pressman, R. *Software engineering – A Practitioner's Approach*, McGraw-Hill, NewYork, 2005.
- [12] Cipolla-Ficarra, V. F, Ficarra, V. M. A Diacritical Study in Web Design: Communicability Versus Statistical Manipulation, In: Cipolla-Ficarra, V. F. (Ed.) *Quality and Communicability for Interactive Hypermedia Systems: Concepts and Practices for Design*, Information Science Reference, Hersey, New York, 2010.
- [13] Xu, J. Benbasat, I. Cenfetelli, R.T. Integrating Service Quality with System and Information Quality: An Empirical Test in the E-Service Context, *MIS Quarterly* 37 (2013), 777-794.
- [14] Rodriguez, A.R. Giulianelli, A. D. Vera, M. P. Trigueros, A. Marko, B. I. E-Governance Survey on Municipalities Web Sites, In: Cipolla-Ficarra, V. F. (Ed.) *Quality and Communicability for Interactive Hypermedia Systems: Concepts and Practices for Design*, Information Science Reference, Hersey, New York, 2010.
- [15] Vargo, S. L. Lusch, R. F. Evolving to a new dominant logic of marketing, *Journal of Marketing* 68 (2004), 1-17.
- [16] Abou. E-service portal, 2014, Accessible: <http://www.abou.se/portal.php> [2014-01-17].
- [17] Pernice, K. Nielsen, J. Eyetracking Methodology: How to Conduct and Evaluate Usability Studies Using Eyetracking, 2009, Accessible: <http://www.useit.com/eyetracking/methodology>
- [18] Jacob R.J.K, Karn K.S. Eye Tracking in Human-Computer Interaction and Usability Research: Ready to Deliver the Promises, In: Hyona, Radac, Deubel (eds.) *The Mind's Eye: Cognitive and Applied Aspects of Eye Movement Research*, Elsevier Science, (2003), 573-605.
- [19] Tobii. Eye tracking studies - Usability and HCI, 2014, Accessible: http://www.tobii.com/en/eye-tracking-research/global/library/customer-cases/usability-hci/#.UtlAL_RDs-X [2014-01-17]
- [20] Iskender, G. Özkan, S. E-government transformation success: An assessment methodology and the preliminary results, *Transforming Government: People, Process and Policy* 7 (2013), 364-392.
- [21] Christiansson, M-T. Wik, M. A Process Oriented User Test on Public e-Services – The Swedish Municipality Case, In: Proceedings of ECIME 2014, (forthcoming).

Revisiting the Problem of Technological and Social Determinism: Reflections for Digital Government Scholars

J. Ramon GIL-GARCIA ^{a,b}, Leonardo F. VIVANCO ^b and Luis F. LUNA-REYES ^c

^a*Center for Technology in Government, University at Albany, SUNY, USA*
joseramon.gil@cide.edu

^b*Centro de Investigación y Docencia Económicas, Mexico*
leonardo.flores@cide.edu

^c*Universidad de las Americas Puebla, Mexico*
luisf.luna@udlap.mx

Abstract. There has been a long-standing debate over the best way to understand the relationships between technology, organizations, individuals, and the contexts in which they are embedded. One point of view proposes that technology can transform organizations and the way individuals behave in society. In contrast, another perspective argues that organizational and social variables influence the way technology is selected, managed, and used. These two perspectives are present in digital government research and both of them have important limitations that affect our understanding of government information technology initiatives. We argue that a more integrative perspective is needed. Moreover, some terms already available in the literature such as ensemble view, structuration, technology enactment, or socio-technical perspective could serve as starting points in this conversation. However, we also argue that a more integrative approach might not be enough and the development of new theoretical lenses based on concepts and variables from different disciplines should be a necessary next step in this process.

Keywords. Electronic government, social determinism, technological determinism, digital government, ensemble view, integrative approaches

Introduction

Governments depend on the collection, storage, and processing of information to fulfill their mission [1]. Thus, the use of information and communication technologies (ICTs), including knowledge, skills and techniques, have always been important for governments to achieve their objectives [2]. The application of ICTs to government settings has led the research field of digital government to important conceptualizations and problematic boundary definitions. Much research in digital government has shown how ICTs have the potential to transform government organizations [3,4]. On the other hand, there are many other studies that show how organizational structures and institutional arrangements affect both implementation and final results of digital government applications [5,6]. Despite advances in the social sciences, overcoming certain forms of mechanistic determinism based on linear causal relationships has not been possible. Further, these same advances suggest the need to overcome epistemological limita-

tions, such as some forms of reality segmentation that result from difficulties in operationalizing complex theoretical models. Sometimes, however, these possibilities are unknown or ignored.

In the field of digital government, although researchers generally recognize the importance of both the technical and social aspects involved in the phenomenon, when they talk about change, whether technological or social, one aspect is privileged over another [7]. The problem seems to be that the epistemological and ontological nature of the socio-technological relationship continues to be unclear [8], or at least without having a consistent theoretical treatment in its empirical applications. Thus, much of the research on digital government ends up falling into one form of determinism: *technological determinism* or *social determinism*. Of course, studies that fall into one of these categories do not assume it explicitly, but simply present their findings in a way that privileges either technology or social factors in the causal relationships. Some studies attempt to show that there is at least a bi-directional relationship between social structures and ICTs. They argue that information systems and ICTs in general, as well as organizational and other social factors affect each other and have mutual impact on their design, implementation, and use [9]. And even though there are now different theoretical developments of this type offering analytical tools to study this mutual impact, it seems possible and necessary to analyze the conceptual scope of those theories and tools to understand the phenomenon in a better way and, if necessary, refine or improve them. It should not be forgotten that, although applied to digital government as a specific field of study, the problem at the core of this discussion is social change and the role of technology in it, which may have implications for research in other domains.

In this way, the purpose of this study is to identify some of the key elements that define both technological and social determinism in the context of government transformation and digital government. Our ultimate goal is to contribute to the construction of a less deterministic view in the digital government field and we think the reflections provided in this paper are a good step in that direction. The paper is divided into four sections, including this introduction. The second section describes technological determinism in general and some of the forms it has taken in digital government. Similarly, the third section addresses the theoretical elements of social determinism and some of the forms that can take in the field of digital government. In the final section we briefly discuss some of the characteristics and limitations of current visions and provide some reflections for digital government scholars.

1. Technological Determinism

Technological determinism can be traced to the school of classical economics and, later, to the origins of sociology with Marx, Weber, and the Frankfurt School, although there are different positions about what theories belong in this category [10,11]. All these authors respond to the changes that arose in modern society as a cause of the trend of scientific-technical rationalization and one of its objectifications, technology, which forms the basis of that society's identity. This type of position supports the reification of technology (especially in the late nineteenth and early twentieth centuries), which attributes metaphysical powers to technology, making it an autonomous agent of social change [12]. Although these authors are not specifically technological determinists in a "strong" sense, technology plays a central role in their theory of modern society.

Technological determinism, like any other form of determinism, has an opposite: voluntarism. Determinism and voluntarism are the two sides of a distinction that occurs in order to explain human action, the state of society, and social change. While determinism assumes that human action is caused by technology, culture or other structural factors, voluntarism holds that human action is the product of individuals having free-will to decide and govern themselves, and thereby social structures.¹ Although determinism is usually linked with materialism and voluntarism with idealism, those are not the only possibilities [13]. Technological determinism supposes a linear cause-effect relationship between technology and one or more social entities or human capabilities [7]. Moreover, like other types of determinism, it is a form of reductionism, reducing the complexity to explain social processes to a single independent variable [11]. This definition applies of course to the most radical technological determinism; other deterministic positions can include additional variables, but assume that technology plays a primary role.

Technological determinism has had various forms within the twentieth-century social sciences, remaining as one of the main lines of explanation of social change. Maintaining generally an optimistic attitude towards the direction of social change, theories imply a sense of “progress” based on the introduction of technology. We can distinguish several types of technological determinism. One of the most basic and important forms of distinction is between “strong” technological determinism and “soft” technological determinism, although there is a whole spectrum of possibilities of location between the two sides of the distinction [14].

Strong technological determinism assumes technology has its own agency, having the power to enact social change and leading to a situation of inescapable evolutionary necessity. Soft technological determinism, on the other hand, assumes that human actors have their own agency and create their own history. In this sense, soft technological determinism considers technology as an element in a multi-causal matrix with other social, political, economic and cultural factors, but keeps the power of technology for change as the main variable, and just rearranges the source of that power.² Statements that characterize strong determinism argue that machines eliminate the anthropomorphic habits of thought [15].

Katz [11] identifies three types of technological determinism: the basic, the mystic, and the postindustrial. The basic type of technological determinism is comparable to the strong determinism. Authors like W. Ogburn from the Chicago school argued that technological innovations were generating cultural and institutional changes and that machines make history and impose patterns that guide social relations. The mystic type may be illustrated with statements like those of J. Ellul, who argues that humanity renounces spiritual values, with utilitarian consequences; human beings surrender themselves to the dictatorship of the artifacts in exchange for the benefits of modernity. Ellul argued that the only way to reverse this trend is a return to faith and religion. In contrast, the postindustrial determinism refers to the new technological items: ICTs. Brzezinski and Toffler consider the new technology transformative for both individuals and organizations. For instance, there is a direct relationship between ICTs and development.

¹ There are a wide variety of authors and schools that would serve as examples of voluntarism. It is enough here to mention the classic works of Isaiah Berlin and Sartre, and works in the field of rational choice and methodological individualism.

² This form of technological determinism can be matched with various forms of social determinism, which have emerged as a reaction to the strong type, as will be seen later.

Bimber [10] distinguishes three versions of technological determinism. The first version includes norm-based accounts. The main references to this version are Habermas, for whom technology acquires its own normativity based on the logic of efficiency and productivity, and Ellul, for whom technology is a phenomenon that dominates the social, political, and economical areas. The second type is the logical sequence account, which establishes a cause-consequence of facts that are culturally independent. One of the authors in this kind of determinism is Miller, who argues that technological changes result in the evolution of society, and that people must adapt to those changes, regardless of their will: technological change has its own dynamic that generate more technology, with the result of social adaptation and evolution. The third category is the unintended consequences account, which refers to unanticipated results. The uncertainty derived from unintended consequences gives technology autonomy and some level of control over humans.

Although the idea of progress based on the promises of social technologization diminished after World War II and the Cold War, they have resurfaced in contemporary views [12]. For example, Castells [16] argues that the era of industrialization has led to the era of an information and network society based on ICTs. Technology is understood as “material culture” and is a fundamental dimension of social structure and social change. In this sense, contemporary society is located in the “informacionalist technological paradigm,” which is based on increasing information and communication processing capabilities through ICTs [16]. According to Katz [11], information becomes the new fetish of society, an intangible asset that acquires its own dynamics that may rule the fate of society. Thus, technological determinism in modern society includes or implies an *informational determinism*, which could be considered as another form of technological determinism.

In the field of digital government, technological determinism has been common, though the position is usually not often taken openly or clearly attributable. Heeks and Bailur [17], for example, point out that much of the work on digital government has a more optimistic attitude about technological determinism than other possible positions, but not necessarily a “strong” form of determinism. One first form of technological determinism in digital government distinguishes the relationship between ICTs and government in terms of the potential for change, leading to improvements in the results of government organizations. Technology, among other things, is viewed to help ensure the most efficient use of resources, increase productivity, improve the quality of services, establish greater convenience for users, improve accountability, and increase citizen participation [18,19]. Moreover, it is assumed that having an integrated information system has the potential to improve the processes of planning and decision-making by government managers and provide easier access to information for citizens and other stakeholders [3]. This kind of causal relationship, in which ICTs are anticipated to have the power to directly transform government organizations and enhance the benefits they give to society is what can be characterized as technological determinism in the field of digital government [17,20].

Therefore, technological determinism in digital government could be characterized as ICTs-induced positive changes in governmental organizations. From this perspective, technology is a sufficient cause for improvements in the internal operation of these organizations [13]. According to Jackson and Philip [19], technological determinism in the field of e-government assumes, for example, that changing the shape of the practices, relationships, and logic of the organization can be calculated and planned as a result of the introduction of certain ICTs, establishing a linear causal relationship where

technology is the cause and change is the predictable and predetermined effect. Problems with obtaining the desired results, e.g. resistance to change, are attributed to problems with existing technology, to its ineffectiveness or lack of functionality.

A second form of technological determinism identifiable in the field of digital government emphasizes the operation of government organizations and their relationship with external stakeholders. This position assumes that digital government can contribute, based on better service provision, to the formation of societal structures and social development in general. The government, as a central actor for social change, has greater power through technology to achieve its objectives for social development through public policies that are powered by ICTs [16]. These two approaches are clearly intertwined, since the internal operation of government is in most cases oriented to services and other external benefits, which in turn act as an indicator of the performance of internal operations.

2. Social Determinism

As seen in the previous section, there are a significant number of attributions made to the power of ICTs in terms of their ability to make significant changes and provide benefits to government, but also to society at large. However, on the other hand, many studies raise a number of factors that can hinder progress and need to be solved in order to access the benefits of the use of new ICTs. The limiting factors to which we refer are of a social nature, which may involve, for example, organizational and administrative processes, the nature of public organizations, the legal and regulatory framework, and, of course, the societal conditions external to the government agencies: economic, political, and cultural factors. These limitations on the use of ICTs by the government, which are then seen to dictate the possible results and the causes of both success and failure, then serve as the dominant form of social determinism in the field of e-government.

Social determinism, much like technological determinism, is not really a strictly defined term. It is an analytical category allowing distinctions and classifications according to the privilege given to a particular causality and its directionality. Therefore, many of the authors or schools of thought mentioned here may even propose a neutral position with respect to such causation; however, since those cases seem to favor social factors over the inherent powers of technology, we believe it is possible to locate them in this way. The ultimate goal is not really to classify authors or streams of thought, but exposing approaches that illustrate what can be understood as social determinism.

Social determinism in general can be observed as a reaction to the strong technological determinism of the late nineteenth century and in much of the twentieth [11]. In this sense, it represents a causal link going in the opposite direction of technological determinism: social factors are what determine how technology is used, especially in the results from its incorporation into society. Technology, according to this position, has no power by itself that can generate a change. Human action is always what builds, implements, and uses technology, and thereby what produces social change. In this sense, technology is, and always has been, a social product [7]. Human skills and abilities to make decisions about and implement technology are what enable its impact. From this viewpoint, technology by itself does not give greater access to public information or encourage citizen participation [18].

As in the case of positions that may fall into some form of technological determinism, there are several ways to approach social determinism. For example, Katz [11] proposed that technological innovation is social. Technology would be the application of scientific knowledge to production under capital standards, therefore, it would not determine, but is determined by the process of accumulation and market rules. For Katz it is necessary for the social sciences to assume a determinism that allows access to the explanatory level, and the necessary determinism is social determinism. As an economist, Katz argues that there are the forces of capitalism and market logic, which determine how technological innovation unfolds. He proposes social determination at a macro or societal level based on Marxism, wherein historical determinisms explains the socio-technological relationship, unlike micro-level determinations of agents or groups that others propose [11].

From the distinction between strong and soft technological determinism, made by authors such as Marx and M.L. Smith [14] and Heilbroner [15], it is possible to find a kind of equivalence between soft technological determinism and social determinism. However, technological determinism seems to establish a chain of positive determination that places technology as a direct causal link to social change, which is preceded by social determination: Social factors → technology → social change. While social determinism would distinguish a relation of negative determination. Soft technological determinism addresses the cause of social change, which is the end result of the technology's power once created. Social determinism observes technology not as a cause, but as an effect of social factors and in a parallel relationship with social change. It is complicated to draw clear and precise limits as to when these distinctions are made.

Authors like Williams [21] seem to agree with the previous position. She argues that research in the field of history, along with work from other researchers in sociology, informally contribute to the "social construction of technology." The auto-named theory of social construction of technology proposes that social groups (and possible subgroups), formal or informal, which are linked by a set of meanings, define the final form of technology. The various social groups are the product of previous cultural, political, and economic influences that shape their position with regard to technology. That is, together with technology, these influences shape the technology that ultimately emerges [22]. With all the nuances and differences that exist between parallel models [23], the work continued by Bijker and colleagues [24] maintains the "non-naturalness" or purity of the technology, affirming its social character, its socialized form, and the human agency as the promoter of social change. And though this theory aims in some cases to go beyond of any form of determinism [11], it appears that, as Jackson, Poole and Kuhn [13] argue, it ends up falling in favor of one of the two sides of the distinction: in this case, toward the social factors of technology, which is distinguished here as social determinism.

For Castells, the studies on information and communication technologies reveal what historians of technology have known for a long time: that technology can only yield its promises under cultural, organizational, and institutional transformations [21]. These perspectives have shown ICTs as dynamic human constructions, both in how they are developed and interpreted, and these constructions reflect the interests and social motivations that gave rise to them [25]. In this sense, positions that fall into social determinism in the field of e-government have the same characteristics. That is, these theories assume that human decisions and human agency, within certain social structures, is what determine the results of technology and the derived social change [17]. Social determinism in the study of digital government, which also contains a "cul-

tural determinism” [19], refers to factors that relate to the practices of individuals and groups, whether in organizations or in society in general, which are the cause of an ICT project’s failure in government. According to this position, these social and cultural forms generate resistance to the change that is sought through the introduction of ICTs. Change that, as with technological determinism, can be obtained via planned changes to the organizational structures and culture prior to the implementation of ICTs. According to Jackson and Philip [19], these social and cultural variables can be isolated and manipulated in terms of the supposed requirements for the success of ICT projects.

The problem then, for this and the other forms of determinism, is to assume that there is a linear relationship of causality between the factors involved that in this case goes from organizational, institutional, cultural, societal, to technology. That way of understanding the causal relationships implies that by manipulating some or all of these inputs to digital government projects, the results can be successfully obtained. However, the results of some studies that try to observe these relations in a more complex way show that technology characteristics and social factors affect each other in bidirectional and circular causal relationships that make their study complicated.

3. Preliminary Results: Some Reflections

Deterministic positions have been common in all fields of knowledge. All determinism cannot be dismissed or completely rejected, because to a large degree Western science has been built on the basis of forms, sometimes more lax and sometimes stronger, of determinism. In the social sciences, as Katz [11] suggests, the recurring problem of purely descriptive conceptions is the omission of a deterministic principle. The comprehension of a phenomenon from simple narration as an account of its form under the influences around it would be insufficient for a full understanding of that phenomenon. It is necessary to take the next step of explanation for the best comprehension of the problem.

However, overcoming determinism in all its forms has been a constant search in some fields of scientific research. It is no different with technological determinism and social determinism. These epistemic positions are increasingly rejected due to the criticism made on its partial way of explaining social change in which technology is involved. The main criticism of technological determinism is the lack of consideration of the factors involved at the societal, organizational, individual, and cultural level. Social determinism, on the other hand, is similarly criticized for the high weight given to social factors in the causal link; downplaying the potential transformational power of technology [11,19].

Many recent historical and sociological studies on the relationship between technology and society arose precisely in reaction to technological determinism [24]. However, the intention of overcoming the problem does not solve it. As mentioned before, the remaining difficulty is that, even with attempts to overcome these forms of determinism, it is very difficult to escape any of them in the end. It seems that research models favoring one side of the distinction do not allow for a more integrated way to study the complexity of the phenomenon [7]. Therefore, most of these studies end up in one form of determinism or another.

In the field of digital government, there have been a number of proposals for overcoming the linear determinism and the segmented forms of observation of the phenomenon involving social change in technology/social-structures relationship. It is assumed

that, although technology has the potential to transform the internal operation of government and dramatically improve the delivery of public services [26,27], the relationship between ICTs and social structures is bidirectional and complex [28,29]. ICTs have the ability to transform governmental organizations, but at the same time they are affected by organizational and institutional factors in their selection, design, implementation, and specific use [30,31]. According to Orlikowski and Iacono [32], these theoretical approaches are classified as the *ensemble view* perspective, and they refer to technology as an embedded system. Using different, but related concepts, all of these theories propose that there is a dynamic interaction between organizational structures and ICTs. Within this perspective are, for example, the enacted technology theory [6], the adaptive structuration theory [28], and the structurational model of technology [33], among other perspectives.

These theoretical frameworks constitute a contribution to overcome determinism in the field of digital government, but still are initial developments that require further discussion and refinement. For example, the theory of enacted technology with its immersion of technology in social, cultural, and psychic structures seems to generate a significant emphasis on the impact of the social on the technological. Although there is a theorized effect of technology on social forms (organizational, institutional), the bidirectional relationship does not seem simultaneous, but rather there is first a social determination and then a technological determination, which occur consecutively in time.

Something similar, but in the opposite direction, seems to apply to the theory of adaptive structuration. As with Giddens' original theory [34], it appears that the agency of the actors or groups first affects the structures, including the technology. In any case, the relationship seems to be simultaneous in the case of the structurational model of technology, also based on Giddens' theory, but its operationalization is not always clear. In these two cases, as in the enacted technology, ultimately what ends up happening is a bi-directional or circular determinism. Linear or segmental partialities seem to be overcome with this type of model. Determinism is depicted in a more sophisticated or complex form in this type of integrative model, but it is still present.

Although as mentioned above, these models offer resources for a better understanding of digital government phenomena, going beyond deterministic views will require experimenting with other theoretical and conceptual resources such as, for example, what Niklas Luhmann introduced in sociology [35]. Concepts such as structural self-determination, operative closure, self-reference, and structural coupling, taken from Maturana [36], can give important insights in the study of digital government as they have done in sociology and other fields. These concepts arise from the effort to answer the problems of causality between a system and its environment. Although cybernetics offered a model that overcame the linear causality by introducing circular causality and the principle of open systems, subsequent advances in systems theory led to a new understanding of causality on the principle of closed systems. Each system can select and integrate different elements with its own internal criteria and operational regulations. This autonomy means, for instance, that the environment cannot determine the system, but rather it is the system that determines its own structure.

What has been attempted in this paper is not to make a simplistic reduction of the research on the relationship between technology and social change based on only two opposing positions, but to emphasize the need for more theoretical and conceptual precision, which involves a greater number of variables and an increased complexity in their relationships. It is clear that many authors who direct their attention to digital government do so in a very optimistic or purely descriptive way. It is necessary to seek

a more analytical discussion on the subject. This discussion should take up some of the problems associated with digital government and clearly articulate the role of the different elements in the system. For better understanding of this socio-technical phenomenon many things are necessary, but clearly one of them is the development of inclusive and comprehensive models that analyze such initiatives in all their complexity and that attempt to go beyond social and technological determinism. We argue that this should mean, at least in part, introducing innovative interdisciplinary theories and concepts to the field of digital government.

Acknowledgments

This research was partially supported by the Consejo Nacional de Ciencia y Tecnología (CONACYT) in Mexico under grant No. 107154. Any opinions, findings and conclusions expressed in this material are those of the authors and do not necessarily reflect the views of CONACYT.

References

- [1] Gil-Garcia, J. R. & Luna-Reyes, L. F. (2003). Towards A Definition Of Electronic Government: A Comparative Review. In A. Mendez-Vilas Et Al. *Techno-Legal Aspects Of Information Society And New Economy: An Overview*. Extremadura, España: Formatex, Information Society Series.
- [2] Landsbergen J. R. & Wolken J. R. (2001). Realizing The Promise: Government Information Systems And The Fourth Generation Of Information Technology. *Public Administration Review* 61(2).
- [3] Scholl, H. J. (2002). E-Government: A Special Case Of ICT-Enabled Business. Unpublished Manuscript, Albany, NY.
- [4] Fountain, J. E. (1995). *Enacting Technology: An Institutional Perspective*. Cambridge, MA, John F. Kennedy School Of Government, Harvard University.
- [5] Fountain, J. E. (2001). *Building. The Virtual State*. Information Technology And Institutional Change. Washington, D.C.: Brookings Institution Press.
- [6] Gil-García, J. R. & Pardo, T. A. (2005). E-Government Success Factors: Mapping Practical Tools To Theoretical Foundations. *Government Information Quarterly* 22(2): 187–216.
- [7] Luna-Reyes, L. & Gil-García, R. (2011-B). Using Institutional Theory And Dynamic Simulation To Understand Complex E-Government Phenomena. *Government Information Quarterly* 28(3): 329–345.
- [8] Leonardi, P. & Barley, S. (2008). Materiality and Change: Challenges to Building Better Theory about Technology and Organizing. *Information and Organization* 18(3): 159–176.
- [9] Bolgherini, S. (2007). The Technology Trap And The Role Of Political And Cultural Variables: A Critical Analysis Of The E-Government Policies. *Review Of Policy Research* 24(3).
- [10] Bimber, B. (1994). Three Faces Of Technological Determinism. In Smith, M. & Marx, L. (Eds). *Does Technology Drive History? The Dilemma Of Technological Determinism*. USA: MIT Press.
- [11] Katz, C. (1998). Determinismo Tecnológico y Determinismo Histórico Social, Redes, Universidad Quilmes, Argentina 5(11).
- [12] Marx, L. (1994). The Idea Of Technology And Postmodern Pessimism. In Smith, M. & Marx, L. (Eds). *Does Technology Drive History? The Dilemma Of Technological Determinism*. USA: MIT Press.
- [13] Jackson, M., Poole, M. & Kuhn, T. (2001). The Social Construction of Technology in Studies of the Workplace. In Lievrouw and Livingstone (Eds.) *The Handbook of New Media*, Sage Publications.
- [14] Marx, L. & Smith, M. (1994). Introduction. In Smith, M. & Marx, L. (Eds). *Does Technology Drive History? The Dilemma Of Technological Determinism*. USA: MIT Press.
- [15] Heilbroner, R. (1994). Technological Determinism Revisited. In Smith, M. & Marx, L. (Eds). *Does Technology Drive History? The Dilemma Of Technological Determinism*. USA: MIT Press.
- [16] Castells, E. (1994). *La Era de la Información*. Economía, Sociedad y Cultura. Vol. 1, México, Siglo XXI 1996.
- [17] Heeks, R. & Bailur, S. (2007). Analyzing E-Government Research: Perspectives, Philosophies, Theories, Methods, And Practice. *Government Information Quarterly* 24(2): 243–265.

- [18] West, D. M. (2004). State And Federal E-Government In The United States, 2004. Providence, RI: Brown University.
- [19] Jackson, S. & Philip, G. (2010). A Techno-Cultural Emergence Perspective on the Management of Techno-change. *International Journal of Information Management* 30(5): 445–456.
- [20] Coleman, S. (2008). Foundations Of Digital Change. *International Journal of Information Management*, 30(5): 445–456.
- [21] Williams, R. (2004). Afterword: An Historian's View on the Network Society. In Castells, M. (Ed). *The Network Society: A Cross-Cultural Perspective*. Edward Elgar Pub.
- [22] Pinch, T. & Bijker, W. (1989). The Social Construction Of Facts And Artifacts: Or How The Sociology Of Science And The Sociology Of Technology Might Benefit Each Other. In Bijker, W., Hughes, T. & Pinch, T. (Eds.) *The Social Construction Of Technological Systems*. Massachusetts: MIT Press.
- [23] Williams, R. & Edge, D. (1996). The Social Shaping Of Technology. *Research Policy* 25: 856–899.
- [24] Bijker, W. & Law, J. (1992). *Shaping Technology-Building Society: Studies in Sociotechnical Change*, Cambridge, Mass.: MIT Press.
- [25] Orlikowski, W. J. (1992). Rethinking The Concept Of Technology In Organizations. *Organization Science* 3(3): 398–427.
- [26] Heeks, R. (1999). *Reinventing Government In The Information Age*. International Practice In It-Enabled Public Sector Reform. New York: Routledge.
- [27] Holmes, D. (2001). *E. Gov. E-Business Strategies For Government*. London: Nicholas Brealey Publishing.
- [28] Desanctis, G., & Poole, M. S. (1994). Capturing The Complexity In Advanced Technology Use: Adaptive Structuration Theory. *Organization Science* 5(2): 121–147.
- [29] Kling, R. (2000). Learning About Information Technologies And Social Change: The Contribution Of Social Informatics. *The Information Society* 16(3): 217–232.
- [30] Kraemer, K. L., King, J. L. et al. (1989). *Managing Information Systems. Change And Control In Organizational Computing*. San Francisco, CA: Jossey-Bass.
- [31] Dawes, S. S., & Pardo, T. A. (2002). Building Collaborative Digital Government Systems. Systematic Constraints And Effective Practices. In Mciver, W. J. & Elmagarmid, A. K. (Eds.), *Advances In Digital Government. Technology, Human Factors, And Policy* (pp. 259–273). Norwell, MA: Kluwer Academic Publishers.
- [32] Orlikowski, W. J., & Lacono, C. S. (2001). Research Commentary: Desperately Seeking the “It” In IT Research – A Call To Theorizing the IT Artifact. *Information Systems Research* 12(2): 121–134.
- [33] Orlikowski, W. J. (2000). Using Technology And Constituting Structures: A Practice Lens For Studying Technology In Organizations. *Organization Science* 11(4): 404–428.
- [34] Giddens, A. (1984). *The constitution of society*. Berkeley and Los Angeles, CA: University of California Press.
- [35] Luhmann, N. (1998). *Sistemas Sociales. Lineamientos para una teoría general*. Barcelona: Anthropos, Universidad Iberoamericana and Centro Editorial Javeriano.
- [36] Maturana, H. (2002). Autopoiesis, structural coupling and cognition: a history of these and other notions in the biology of cognition. Santiago: Instituto Matritico.

This page intentionally left blank

Evaluation

This page intentionally left blank

An Evaluation of the State of Local e-Governance in Bangladesh

Mohammad Shahadat HOSSAIN^{a,1}, Tanja SVARRE^b and Pär-Ola ZANDER^b

^a*Department of Computer Science and Engineering, Chittagong University,
Chittagong-4331, Bangladesh*

hossain_ms@cu.ac.bd

^b*ICT4D, Department of Communication and Psychology, Aalborg University,
Nyhavnsgrade 14, 9000 Aalborg C
{tanjasj,poz}@hum.aau.dk*

Abstract. The government of Bangladesh has during the latest 5 years espoused ambitious goals for digitalisation. As a result, many services of local government are now online, and all the districts, many municipalities, all city corporations, many Upazilas in the Bangladeshi nomenclature, some union parishad have now established web presence. This paper presents an evaluation of the state of e-Governance in three of these districts. We report the self-assessment of Bangladeshi ICT professionals who are working with the implementation of the services, as well as the citizen's evaluations. The method is mainly quantitative. This evaluation sheds important light on Bangladesh's progress, and is useful for further comparative work with Bangladeshi governmental levels, or comparisons with other countries. The result is that the perceived usefulness of Bangladeshi e-government is rather good, which complements the picture of Bangladesh as frequently low scorer on e-readiness indexes.

Keywords. Local government, evaluation, developing countries, expert systems

1. Introduction

Governments in many countries are investing vast resources into e-government with an aim to, for instance, acquire increased efficiency, new business models and support democratization. So does Bangladesh. For the latest 10 years, 'digitalisation' has been high on the political agenda. Many new services have been developed on national and local levels. The context for designing services is also rapidly changing. Bangladesh is becoming more electrified, there are large investments in backbone internet, and the citizens of Bangladesh get inspired by the changes globally in online matters.

However, it is necessary to evaluate the efficiency and effectiveness of the e-government of a country, because there exists little knowledge on the impact and results associated with e-government projects and their capacity for real fundamental transformation of relationship between governments, citizens, businesses and employees [1,2]. Benchmarking may be a useful tool for the improvement of government. Since the development of e-government is a continuous process, projects need continuous assessment of its nascent stage or the transactional stages, in order to achieve its aims

¹ Corresponding Author.

and for the stakeholders to take appropriate decisions [3,4]. Bangladesh's recent projects are criticized even from within government not to be sufficiently evaluated [5]. Bangladesh is regularly monitored in various e-readiness indexes in comparative research. However, while useful for national policy-making, it is still a relatively crude measure, whose results will not be very helpful for the individual stakeholder in specific projects. Moreover, as we will argue in Section 2, the extent of local e-governance studies is limited. By local governance, we mean tasks such as local government web presence, and services such as information on rules and regulations such as country's present ICT act, the right to information act of Bangladesh, basic online submission and contact for further inquiries. A gap in knowledge about such matters is crucial, as local e-government is very important. The research question of this paper is therefore: What is the overall usefulness of the local e-government of Bangladesh? In particular, we concentrate on various aspects of its usefulness. The aim of this paper is to shed light on Bangladesh's progress as of today's date, and to provide basis for further comparative work with Bangladeshi governmental levels, or comparisons with other countries.

2. Related Work

The state of e-government in Bangladesh in general has been studied to some extent, as is befit for a country of over 150 million citizens. Various national comparisons have been conducted between nations. Empirical studies that detect barriers, challenges and success factors for e-government in general have been published. United Nations [6] rate Bangladesh at 150th place, lagging, and in the middle in the region of Southern Asia. ITU's ranking IDI is much less flattering from 2008, and there are speculations in the popular press that the Bangladeshi authorities deliberately avoided getting rated in order to avoid bad press [7]. Khan et al. [8] overview the evaluation of Bangladeshi e-government. While the country on the national level cannot surprisingly compete with the most developed countries, Bangladesh is considered one of the leading countries amongst the Least Developed Countries.

However, these studies are mostly based on data and public discourse regarding the *national* e-government. Bangladesh's governance is divided in a number of levels; Division, divided into districts, divided into upazilas. Our literature search has not found any work that reports the state of affairs of the Bangladeshi districts or sub-districts. ***There is very little research on evaluation of local e-government in general in the area.*** However, this work is, while valuable, not focused on e-governance per se, but rather on telecenters, rural use of ICT or other issues where the local e-government is part of the context but not the central topic. Bhuiyan [9] is a literature study on eGov in Bangladesh. But a lot of the literature is from other countries, whose claims are inferred to Bangladesh, with context in mind. In particular it focuses on "two case studies namely the OPEN of Seoul Metropolitan Government in South Korea and the Gyandoot (purveyor of knowledge) Community Network in Madhya Pradesh in India, so as to identify any relevant lessons that could be learned from them in the context of Bangladesh." The study of Gyandoot is, although being from India, perhaps the case where we from literature can learn the most about local governance in Bangladesh. Bhuiyan describes qualitatively many features of Bangladeshi conditions for e-government, such as underlying civil laws, the current policy goals, organisational issues, and corruption. There more academic work in India published on this issue, which is probably the con-

text that is most similar to Bangladesh, with their common legacy in British colonial rule, relatively similar culture (compared to e.g. Myanmar) and economic conditions. Yet there are enormous differences as well; political structure, India's stronger ICT industry, Bangladesh's NGO prevalence. And local governments have historically been very much subordinate to the central administration of Bangladesh [10]. But this just makes it interesting – will the centralisation allow for fast dissemination or to stifled, fossilised administrative practices?

Naturally, Bangladesh has a political history of its own of the growth of its e-governance. During the nineties and millennium, Bangladesh was not very pre-occupied with ICT. *But In 2002, the government started to focus and invest more heavily in ICT with "ICTs Policy 2002"*. However, the programme had severe problems to meet the expectations. The digitalisation of Bangladesh got renewed energy with the Digital Bangladesh Vision 2021 (championed by the newly elected Awami league) in 2009. Leading bureaucrats, such as Nazrul Islam Khan use the rhetoric that ICT and ICT-mediated services can replace garments as Bangladesh's largest export sector [11], which would indeed be radical. So while Awami league was not the first to focus on it, but they and the administration reinvigorated it, and were able to implement the initiatives with increasing success. Perhaps this was also helped by generally larger e-readiness, lower hardware costs and inflow of proven technologies and best practices from abroad. The flagship of Bangladeshi e-government has so far been the Web portal of Bangladesh (<http://www.bangladesh.gov.bd>). Here, a lot of information from the government can be found. But Bangladesh's e-government is still largely static and one-sided [8]. However, we are interested in evaluating the local government sites of Bangladesh.

The internet penetration in Bangladesh is about 23%, i.e. about 36 million people [12] out of 156 million (<http://www.bbs.gov.bd/home.aspx>). However, this can be misleading. Many citizens act "by proxy", telecenters, more capable relatives & friends, or even "info-ladies" (for the latter, see [13]) and utilise the e-government services. So while low levels of internet access and literacy is problematic, and proxy use brings additional problems of their own, the demographics **should not lead us to the conclusion that e-governance is a peripheral phenomenon.**

While Bangladesh's governmental presence has certainly become more digitalised during the last decade, it is not only a question of 'more'. Khan et al. [8] depict the development of Bangladesh's electronic government–citizen interaction as overshadowed by elitism, corruption, and the lack of accountability and transparency. They go on to say that "The way technology is shaped in such processes seems to reflect more government interests and even sponsors' views than those of citizens, which will be a problem especially in those aspects of Web portal that are tailored to citizens" [8, p. 259]. But are such tendencies equally prevalent at the local level? Nobody knows empirically.

We see one aspect of the local government as particularly interesting. UNDP's A2I programme, one of the main efforts to reach a "Digital Bangladesh" has concluded that in the first phase of it:

"Monitoring and evaluation, has not been undertaken as a regular activity of the project management. Quantifiable, measureable and time-bound output and outcome targets need to be included in the annual work plan of the programme and an M&E system needs to be instituted to support project management tasks to help demonstrate the impact of e-services on social/economic development."

I.e. there is a need to monitor, and for formative as well as summative evaluation of Bangladesh's new e-government [5, p. 18]. **We concur with the evaluation, and our main contribution is to evaluate the present state of government, in line with this related work.**

E-government is very complex since it involves intricate relationships between technological, organisational, institutional and contextual variables [14]. These variables play an important role to determine the characteristics variables such as quality of user environment, electronic management, e-services etc. [2]. For example, the quality of e-government applications (personalization, usability, accessibility and so on) are related to a series of determinants such as institutional and organization frameworks, as well as on the technological infrastructure. High quality applications will produce expected results and benefits such as transparency and accountability, efficiency and effectiveness, citizen participation, effectiveness and program policy, and ultimately high quality of public service. The above variables can be grouped into three categories, namely Determinants (D), Characteristics (C) and Results (R); and they are complicatedly interrelated. Therefore, in order to capture the complexity of e-government, an evaluation model should be developed based on these three categories of variables [2]. This approach would allow the evaluators to perceive how the results are produced and to identify the contributing role of each variable in the overall evaluation of the e-government in an integrated way. Other approaches [4,15–20] don't allow such an evaluation. We consider that an overall evaluation establishes a measure of the usefulness of the system [21], who defines it as "*Usefulness* is the issue of whether the system can be used to achieve some desired goal." [ibid, p. 24]. Such an approach would allow the decision makers to develop an appropriate policy, enabling the enhancement of future e-government initiatives of a country. It is interesting to note that many of the variables that e-government literature deals with, and which we will delve more into below, cannot be measured with precision or with 100% certainty. The reason for this is that most of the variables are subjective in nature, for example, usability, which can't be measured with 100% certainty. Hence, any approach to evaluate e-government should consider this uncertainty phenomenon.

Since e-government evaluation is a problem that ultimately involves human judgement (e.g. of perceived quality or political trade-offs), purely algorithmic solutions cannot be considered. The problem of this nature is often handled by developing an expert system. An expert system consists mainly of two important parts: The knowledge-base and the inference engine. The next section will introduce the method to develop the expert system, enabling the handling of uncertainty issues of the e-government variables as discussed. A brief discussion on the data collection procedures will follow this.

2.1. Evaluation Baseline

We have considered 21 variables under the above mentioned categories i.e. Determinants (D), Characteristics (C) and Results (R), drawing on [2]. The main determinants as identified in the literature consist of quality of the information and existing data to feed the systems (QoI), technological infrastructure and compatibility (TI), organisational and management characteristics (OC), existing legal and institutional framework (ELF) and potential demand (PD). The variables related to Characteristics component consists of quality of information available on web sites and in systems (QoI), privacy

(PRV), security (SEC), interaction (IR), integration (IG), personalization (PRS), accessibility (ACC), usability (US) and services (SER). The main e-government result (R) variables as identified in the literature are the followings: statistics on systems usage (SU), quality of public services (QPS), efficiency and productivity (EP), effectiveness of programs and policies (EPP), transparency and accountability (TA), citizen participation (CP) and changes in the regulatory framework (CRF). These variables are in one way or another subjective in nature and hence inherit various types of uncertainties [22].

3. Method

A Belief Rule Base (BRB) is a knowledge representation schema, which allows the capturing of various types of uncertain information. Evidential Reasoning (ER) is used as the inference methodology in the Belief Rule Based Expert System [23,24]. ER is mainly used to aggregate the rules in the BRB either in a recursive or analytical way. This approach is widely known as the RIMER methodology. A BRB can capture nonlinear causal relationships under uncertainty between antecedent attributes and the consequent, which is not possible in traditional IF-THEN rules.

The Belief Rule Based System consists of its input, inference procedures and output components. Inference procedures consist of input transformation, rule activation weight calculation, rule update mechanisms, followed by the aggregation of the rules of a BRB by using ER. This aggregation allows obtaining the distribution of belief degrees for the consequent (C) attribute for the given values of antecedent attributes (input data) of a BRB (P_i). This aggregation allows the assessment of the main components of e-government evaluation, consisting of determinants, characteristics and results individually by taking account of their associated antecedent attributes. Thus, the assessment of e-government can be achieved at the top level as well at the mid-level. The assessment of the components mentioned can be considered at the mid-level, while overall evaluation or usefulness of e-government at the top level. Such an approach would allow for the identification of the variables playing important role in improving or degrading the performance of an e-government project. The RIMER methodology has been employed to develop expert systems to evaluate e-governance. The details of the methodology to develop the expert system to assess e-government will be found at [22].

3.1. Data Collection Procedures

A *multi-staged stratified sampling* technique has been employed in this research. The region of interest is divided into areas to ensure a precise sampling. For some surveys, there is always under-coverage, which contributes to the missing of persons from the sampling frame, which is a physical representation of all the elements in the population from which the sample is drawn [25]. To overcome this, the authors collected data from internal and external personnel or experts (people who are nominated by the Bangladesh government to execute the E-Government system with proper knowledge and training, considered as internal personnel while the people who are getting benefits or services from the E-Government System are called external personnel) through survey questionnaires which are quantitative in nature. This will also help to evaluate

Table 1. Sample Frame for Internal Experts/Personnel

Categories	Chittagong Division	Population	Subjects/sample
DC	Chittagong,	11	3
ADC	Cox's Bazar,	25	3
Programmer of DC Office	Bandarban	11	3
SP		11	3
Programmer of SP Office		11	3
CO: from 7 UP such as Cauchua, Garinga, Doddissar, HaliShahar, Madrasa, Rowshan Hat, Dholessari	Patiya (sub district of Chittagong)	80	7
Total		149	22

DC: Deputy Commissioner, ADC: Additional Deputy Commissioner, SP: Superintendent of Police, UP: Union Parishad (administrative unit under police station), CO: Computer Operator

whether BRBES (Belief Rule Based Expert System) can process data received from multiples stakeholders. Table 1 is the sample frame which was used for the internal personnel or experts.

In this research, three dimensional data (determinants, characteristics and results) from 454 internal and external respondents have been collected for the analysis, which were good enough because sample size larger than 30 and less than 500 are appropriate for most research [26]. The external respondents are users of the e-government systems.

4. Results

In this section, we present the perception of e-government of the districts as evaluated by internal and external respondents. The evaluation is made with emphasis of the aggregated perceptions into e-government usefulness.

Our data are an extensive set of quantifications of the complex e-governance practice, which is daunting to interpret, whether you are a user, a manager, an e-government expert or some other stakeholder. The BRB-RIMER methodology allows for an aggregation of the data. The above data is fed into the belief rule based expert system software (BRBES) to obtain the aggregated assessment grade on the three components (Determinants, Characteristics and Results) and also to obtain the aggregated overall grade on the performance of the local e-government service.

Here, we can see that e-governance is relatively evenly performing in Bangladesh. There is no large disparity between the determinants and the results. The values are also at a 0–1.0 scale, where 1.0 is the optimal value. The experts are inferred to rate the local e-government at a usefulness of 0.725. There is no objective translation of what that means qualitatively. There is not (yet) any comparative data for benchmarking (but we hope that further studies can provide that), but indicates that the e-governance is, for the experts, relatively satisfactorily. We will unpack that in the discussion section.

Does it make a difference with the BRBES software and its aggregating methodology? For comparison, a crude average of the data is provided below. It can be seen that the overall usefulness of the system is significantly lower. The difference lies in the handling of uncertainties and ignorance, which is dealt with in the next subsection.

Table 2. Aggregated grading of the local e-government

Method	Determinants	Characteristics	Results	Overall E-government
BRBES	0.690 CI (0.408–0.804)	0.629 CI (0.450–0.824)	0.750 CI (0.432–0.790)	0.725 CI (0.501–0.86)

Table 3. Aggregated grading of the local e-government without RIMER methodology

Method	Determinants	Characteristics	Results	Overall
LRF	0.515 CI (0.378–0.645)	0.559 CI (0.397–0.693)	0.5625 CI (0.320–0.607)	0.535 CI (0.368–0.612)

4.1. Variance Between Respondents

While the internal experts qualify all variables, the external users are *ignorant* (in the sense that they do not feel that they can rate many variables) regarding many variables. There are 8 variables (such as Technological infrastructure, and organisational infrastructure) that get consequently ignored. The users differ from the experts in many aspects on issues that they do rate, but what we are concerned with here is to report the *aggregation, i.e. the usefulness*.

The three districts of Bangladesh are quite different, one metropolitan, one rural and with indigenous people, and a third in a coastal area with quite different industry (tourism, fishing, etc.). However, the results are relatively homogeneous (Variance in usefulness).

The internal experts rate the usefulness of the e-government system similarly to the experts. We will limit ourselves here to the Chittagong district. The experts rate it as 0.51, whereas the users score it as 0.47.

5. Discussion

The overall score of the usefulness of local Bangladesh e-government is 0.725. The common sense interpretation of that would be “rather good”, with place for small improvements, to achieve the most useful e-government imaginable. Now, with Bangladesh not being one of the recognized world-leaders of e-governments, and with functionality that is rudimental as compared other countries, that is quite surprising. Bangladesh has many determinant factors that limit its performance; e.g. electricity, illiteracy, and a relatively short history of digitalisation of government (where “child diseases” are reasonable to occur). Can the result be interpreted as “with the constraints given, Bangladesh is doing fine”? No, such reasoning should be indicated by low determinants and high characteristics and results. Rather, it indicates that the experts do not take foreign e-government as their “benchmark”. Instead, they compare the e-government with other national phenomena. Speculatively, it may be corporate IT. Furthermore, they may take a historical perspective. The state of e-government may have its flaws, but it may be perceived as a huge improvement with the state of information some years ago. Another possible explanation is that they are simply unknowing of the possibilities of e-government, and the shortcomings of the systems (caused not by lack of skills, but of immaturity and infrastructure). A third explanation is that Bangladeshi local e-government professionals are self-complacent and settle low, but we want to emphasize that we have insufficient data for such accusations – rather it illustrates that

there is a need for qualitative studies which can rule out such suspicions. Finally, we would like to remind the readers that earlier work in expert systems [22] seem to indicate that aggregating the perceptions by BRBES gives a more accurate picture than simply calculating the averages – that is a contribution of this paper.

The aggregated value (0.725) shows the usefulness. The question is: usefulness for whom? The e-government professionals are supposedly in the service of the people and the upazila, and hence evaluate the performance of the system as a combination of serving partly opposing interests. It measures the usefulness in the win-win situations between stakeholders of e-government.

This study has several limitations: We do not currently have historical data that allows longitudinal comparison of the tendencies. There is no qualitative data that complement the results. The external survey data are not drawn from a random sample (something which is very hard to do in Bangladesh).

6. Conclusion

The usefulness score has been found to be 0.725 out of 1.0 in the three sub-districts. What are the generalisation possibilities, given the limitations of the study? The results are possibly skewed in various ways. Still, they have a degree of verisimilitude [27] due to the methodology, and since there, as our reporting of existing literature shows, is very little empirical literature on local government level, our reporting is a substantial contribution compared to the present alternative that we are left to in Bangladesh – individual subjective judgement and what is stated in mass media. Therefore, we conclude that the present perception of local e-government is relatively good in Bangladesh – the exact reasons for this still lay open to interpretation.

6.1. Further Research

As mentioned, we have reported the overall score of the usefulness of local Bangladesh e-government is 0.725. We feel that it is an important first step for generating a baseline to which further research can compare itself. It would also be interesting with some comparative research between nations, where citizens from one nation could appreciate the services provided in the other nation.

References

- [1] Esteves, J., Joseph, R.C.: A comprehensive framework for the assessment of eGovernment projects. *Gov. Inf. Q.* 25, 118–132 (2008).
- [2] Luna-Reyes, L.F., Gil-Garcia, J.R., Romero, G.: Towards a multidimensional model for evaluating electronic government: Proposing a more comprehensive and integrative perspective. *Gov. Inf. Q.* 29, 324–334 (2012).
- [3] Al-Sebie, M., Irani, Z.: Technical and organisational challenges facing transactional e-government systems: an empirical study. *Electron. Gov. Int. J.* 2, 247–276 (2005).
- [4] Gupta, M.P., Jana, D.: E-government evaluation: a framework and case study. *Gov. Inf. Q.* 20, 365–387 (2003).
- [5] Access to Information (A2I): Strategic priorities of Digital Bangladesh. Prime minister's office (2010).
- [6] United Nations: E-Government Survey 2012: E-Government for the People. United Nations, New York (2012).

- [7] Mamun, A.: Telecoms missing from global list, <http://archive.thedailystar.net/newDesign/news-details.php?nid=254834>, (2012).
- [8] Khan, M.A.H., Anttiroiko, A.-V.: Democratizing Digital Bangladesh. In: Anthopoulos, L.G. and Reddick, C.G. (eds.) *Government e-Strategic Planning and Management*. pp. 245–261. Springer, New York, NY (2014).
- [9] Bhuiyan, M.S.H.: e-government applications in Bangladesh: Status and challenges. Presented at the ICEGOV 2010 conference.
- [10] Rahman, H., Robinson, M.: Governance and State Effectiveness in Asia. *IDS Bull.* 37, 130–149 (2006).
- [11] The Bangladesh Chronicle: BASIS honours top performers in ICT industry, <http://www.bangladeshchronicle.net/index.php/2013/04/basis-honours-top-performers-in-ict-industry>, (2013).
- [12] Bangladesh Telecommunication Regulatory Commission: Internet Subscribers in Bangladesh February, 2014, <http://www.btrc.gov.bd/content/internet-subscribers-bangladesh-february-2014>.
- [13] Romke, R.: May e-governance create digital divide. *Asian Bus.Rev.* 3, 108–113 (2013).
- [14] Helbig, N., Ramón Gil-García, J., Ferro, E.: Understanding the complexity of electronic government: Implications from the digital divide literature. *Gov. Inf. Q.* 26, 89–97 (2009).
- [15] Dawes, S.S.: The Evolution and Continuing Challenges of E-Governance. *Public Adm. Rev.* 68, S86–S102 (2008).
- [16] Esteves, J., Joseph, R.C.: A comprehensive framework for the assessment of eGovernment projects. *Gov. Inf. Q.* 25, 118–132 (2008).
- [17] Karunasena, K., Deng, H.: Critical factors for evaluating the public value of e-government in Sri Lanka. *Gov. Inf. Q.* 29, 76–84 (2012).
- [18] Raus, M., Liu, J., Kipp, A.: Evaluating IT innovations in a business-to-government context: A framework and its applications. *Gov. Inf. Q.* 27, 122–133 (2010).
- [19] Stowers, G.N.: Measuring the performance of e-government. IBM Center for the Business of Government, Washington DC (2004).
- [20] Verdegem, P., Verleye, G.: User-centered E-Government in practice: A comprehensive model for measuring user satisfaction. *Gov. Inf. Q.* 26, 487–497 (2009).
- [21] Nielsen, J.: Usability engineering. Elsevier, Amsterdam (1994).
- [22] Shahadat, H., Zander, P.-O., Kamal, M.M., Linkon, C.: Belief-Rule-Based Expert Systems for Evaluation of E-Government: A Case Study. *ArXiv E-Prints Submitt. Expert Syst.* (under review).
- [23] Yang, J.-B., Liu, J., Wang, J., Sii, H.-S., Wang, H.-W.: Belief rule-base inference methodology using the evidential reasoning Approach-RIMER. *IEEE Trans. Syst. Man Cybern. – Part Syst. Hum.* 36, 266–285 (2006).
- [24] Zhou, Z.-J., Hu, C.-H., Xu, D.-L., Yang, J.-B., Zhou, D.-H.: New model for system behavior prediction based on belief rule based systems. *Inf. Sci.* 180, 4834–4864 (2010).
- [25] Sekaran, U.: *Research Methods for Business: A skill-building approach*. John Wiley & Sons, United Kingdom (1999).
- [26] Roscoe, J.T.: *Fundamental research statistics for the behavioural sciences*. Holt, Rinehart and Winston, New York (1975).
- [27] Popper, K.R.: *Conjectures and refutations: the growth of scientific knowledge*. Routledge, London, New York (1963).

The Public Value of Social Media in the UK Public Sector

Mohamad W. OSMANI, Vishanth WEERAKKODY¹, Uthayasankar SIVARAJAH
and Ramzi EL-HADDADEH

Business School, Brunel University, Uxbridge, Middlesex, UK

Abstract. Over time public sector organisations in the UK have invested heavily on ICT projects to transform their services. During the last couple of years, Social Media applications have been used by the public sector as a complementary tool to make services more effective and transparent. In this context, the implementations of ICT projects have followed private sector business models and principles. Yet research shows that many ICT enabled initiatives have failed to deliver the desired outcomes for public sector organisations. While the evaluation of ICT projects in the last two decades have been primarily based on quantitative measures that focused on economic and technical outputs, recent studies have emerged that highlights the significance of creating public value through ICT projects. In this respect, social media applications can play a significant role. The aim of this study is to use public value framework as a lens to understand the impact of Social Media applications in generating public value when used in a local government context.

Keywords. Public value, social media public sector, new public management (NPM), services introduction

Introduction

In the last three decades, the UK Government has implemented several initiatives to transform the management and service delivery capabilities of their public administration. These initiatives have been based on structural reforms, efficiency, control, coordination, performance management and managerial leadership [6]. Interestingly, ICT in general and electronic government (e-government) in particular was introduced in the late 1990s as a tool to improve the range and quality of public services offered to citizens and businesses and to make governments more efficient, effective, transparent and accountable [18]. Thus, e-government has increasingly become an integral part of transformation efforts in the public sector. Weerakkody et al. [42] define the e-government influenced transformation of public sector organisations as the “transformation of government operations, internal and external processes, structures and culture to enable the realisation of citizen-centric services that are transparent, cost effective and efficient” (p. 321). More recently, Social media has been used as a new channel for delivering public services that aid citizen engagement and participation. Government organisations have used social media applications and benefited from greater transparency and accountability, improved accessibility of public services, improved

¹ Corresponding Author. ESGW 217, Brunel University, Uxbridge, UB8 3PH, United Kingdom, Email: vishanth.weerakkody@brunel.ac.uk.

efficiency in public sector, improved quality and effectiveness of public services and empowered citizens [21]. Such use of social media to transform public services are characterised by some as 'public sector behaving similar to the private sector'. A number of studies have highlighted that government organisations use new public management paradigms as a strategy to implement their online service delivery projects [19,20,34,35]. Social media is linked with the replacement of new public management (NPM) governance paradigm to digital era governance (DEG) that enables participation, transparency, collaboration, crowd sourcing and sharing of information within government organisations and across government organisations [14]. Kelly et al., [23] outlined that in the 1980s and 1990s government policies underpinned by NPM were evaluated through financial practices used by private sector businesses and ignored other outcomes that are hard to measure in quantitative terms. Therefore, the literature indicates that evaluation of social media use in the public sector should focus on achieving desired outcomes rather than narrowly focusing on cost efficiency. The aim of this study is to use public value framework as a lens to understand the impact of Social Media applications in generating public value when used in a local government context. In line with the aim, this study will investigate the research question of how is public value achieved through the use of social media applications for local government authorities? In order to explore the research aim and research question, this paper is structured as follows: the next section will describe the evolution of ICT in Public Sector; then it will define social media within the context of government organizations; thereafter it will critically explain public value theory followed by the description of a case study and finally providing a discussion and conclusion for the study.

1. The Evolution of ICT in the UK Public Sector

Over the last three decades there were several major efforts to transform the organisations and management of central government in the UK [26]. The management of public sector has been the centre of reforming attention at all times, however the pace accelerated in 1980's [3,16]. The UK government promised a reduction of waste and bureaucracy in government during this period [7,8,33,38]. In addition, the government favoured a more 'business like' approach and emphasised on the three principles of efficiency, effectiveness and economy [39]. Alongside these initiatives, in 1980's the UK government further used ICT as a vehicle to transform government organisations [14]. ICT was used to shift the public organisations from traditional hierarchical bureaucracy to a more dynamic customer focussed networks that provided better public services. A good example of an information technology project in the 1980s is the installation of 35000 computer terminals in all social security departments where 18 million benefit enquiries a year were handled [38]. The development of ICT emphasised on making the public sector more efficient, competitive, decentralised and accountable [14,19]. A large number of studies highlighted this trend as NPM paradigm and the UK government used it as a strategy to implement its ICT projects [19,20,34,35].

In the late 1990's another major set of reforms was launched under the title of 'Modernising Government Initiative' by the newly elected labour government at that time in the UK [15]. This initiative intended to be a key element in the UK public sector and meant to bring a 'step change' in the functioning of civil services rather than a continuous improvement [5]. The main aim of modernising government was to make public services more joined up, provide high quality and efficient services and design

services upon the needs of service users and not providers. The Modernising Government Initiative aimed to use ICT as its core for transformation; therefore the government developed a number of ICT strategies to improve public services labelled as e-government strategic framework, Transformational government strategy and Government ICT Strategy. The ICT alterations that occurred in the late 1980's had very limited transformative impact, yet the more recent period with development in the Internet had great implications on public services. In the current period, ICT is used to provide electronic services that publish information and enable citizens to freely interact and transact with government organisations. Furthermore, ICT is used to transform public services through facilitating collaboration and participation of different stakeholders [14]. For example, the merger of employment service and welfare benefits operations in the UK's Department of Work and Pensions and the integration of Inland Revenue and HM Customs and Excise into a single national tax agency hugely rested on extensive IT integration programs [14]. The public administration literature identified this new trend of reforms as joined-up government, whole of government, collaborative governance, new public governance, public value management and digital era governance [6,14,32,37]. These paradigms demonstrate the emergence of a new form of network governance and government organisations use ICT to support participation between the networks. In recent years, social media platforms are used as a participation tool to support the new networked forms of organisations. The benefits of social media application for government organisations include greater transparency and accountability of public sector, improving accessibility of public services, improving efficiency in public sector, improving quality and effectiveness of public services, supporting new models of governance, empowering citizens and bridging the digital divide [21,44,45]. In particular, local councils are using social media as a way to engage and communicate with huge number of residents at a local level that was previously not possible. Furthermore, other benefits of social media applications for local councils include, cost savings, boosting democratic engagement and increasing staff collaboration and communication [45,46].

2. Social Media in the Public Sector

Social media refers to a set of online tools that provide platforms to create online communities to connect people and share information. Social media tools include Blogs, Wikis, Facebook, Twitter, LinkedIn, Four-Square, YouTube or Flickr and many more. Social media tools are designed to promote and to facilitate the sharing and diffusion of information through social linking and interactions among people [31]. Davis and Mintz [13] have distinguished social media applications into four characteristics. The first characteristic is user-generated social content where it enables site visitors to submit contents that others can access. The second characteristic is social networking where it allows users of social media to join together in online groups and relationships, which also enable users to see identity related information about the people to whom they are connected. The third characteristic is collaboration that allows users to engage in conversations, co-creation of content, collaborative filtering, and collective action. The fourth characteristic is cross platform data sharing which allow users to share content through transferring data across sites. Furthermore, social media can be also categorised into internal based and external based applications in a government context [9]. The internal based applications could include internal blogs, wikis, video

webcasts and other applications that are maintained and controlled by government organisations [44]. On the other hand, external based social media applications could include Twitter, Facebook, Blogspot, YouTube and other channels that are handled by third part organisations which government organisations have no control but are leveraged to engage with the citizens. In case of Governments, these social media applications are creating architecture of participation which enable users not only to be passive consumers of content and services but also active contributors and designers in their own right. The public sector agencies that use social media application often experience a high level of participation with citizen [36]. Moreover, social media platforms are used for cross agency co-operation within public sector, for example, Doctors.net.uk is an online community for doctors and medical [21]. The use of social media in government organisations have demonstrated or claimed concrete efficiency savings through encouraging users to shift to cheaper channels and increasing staff productivity [44]. Therefore, social media has a huge impact on public services and exploits connections between users, thus provide multiple opportunities to create added value to services [21].

Social media is also linked with the replacement of new public management (NPM) governance paradigm to digital era governance (DEG) that enables participation, transparency, collaboration, crowd sourcing and sharing information within government organisations and across government organisations [14]. This new form of digital era governance highlights that the end result of using social media applications should be to achieve public value. However, scholars such as Kelly et al., [23], Cordella and Bonina [11] and Sivarajah et al. [44] argue that government organisations are currently imitating private sector techniques in evaluating social media applications and mainly focusing on private values. In this respect, public sector should not imitate private sector in search for public value, instead public managers should be given the task of defining public value in the context of public sector and should reposition their organisations to create that value [29]. Similarly, governing is not the same as buying and selling goods in a market economy, thus defining public value from private sector experiences may not be appropriate in the public sector [37]. Moreover, government organisations are evaluating social media on the concept of cost efficiency and measuring media results or outputs [11,17]. For example, the amount of fans or visitors in an organisation's social media site will not generate any benefit if it is not creating public value. Thus, this form of evaluation ignores other set of outcomes desired by the public [11,22,23]. This study will develop a public value framework and use it as a lens to describe the impact of social media applications in the UK public sector.

3. Public Value Theory

The concept of public value theory was first introduced by Moore in the US [29]. Since its emergence public value theory has grown interest among both academics and practitioners. Moore's value theory proposed a strategic triangle which posits that a strategy for a public sector organisation must meet three broad tests. First, it must be aimed at creating something significantly valuable, secondly it must be legitimate and politically sustainable, and thirdly it must be operationally and administratively feasible [2]. In the UK, the concept of public value theory was first introduced in a cabinet office report [23]. The cabinet office report observed that public value can be outlined in three broad dimensions; services, outcomes and trust or legitimacy. Furthermore, Stoker [37] pro-

posed public value as a new public governance paradigm and outlined four new propositions to guide public managers in generating public value. However, the propositions are normative and are not tested empirically in real life. O'Flynn [30] further argued that public value management tends to focus towards one best way orientation and is unclear about the level of the public sector to which it applies. Moreover, Alford and Hughes [1] suggested that public managers should not use a universally fit model for delivering public value; rather they should use an approach that focuses on what is most appropriate on the particular circumstance.

Moore's Public value framework is criticised for giving far too much responsibility to managers and demands insufficient accountability from them [43]. Moreover, Alford and O'Flynn [2] critique public value by questioning whether it is an empirically derived theory or normative prescription. Benington [4] developed an alternative public value framework and defined it in term of ecological, political, economic, social and culture aspects of value. Coats and Passmore [10] modified the public value strategic triangle into a new triangle consisting of three elements of authorise, create and measure. A study highlighted that Moore's public value framework is further developed as a public management paradigm, rhetoric, narrative and performance [2]. A recent study thoroughly observed public value theory literature and found out that there is lack of empirical investigations either of its normative propositions or its value as a framework for understanding public management practices [43]. Furthermore, there is no specific definition of the term public value and it offers no theoretical propositions to test or provide guidance on how to empirically test the term [28].

However, there are a number of studies that empirically tested the propositions of public value. Two studies used public value framework of services, outcome and trust as an analytical framework and empirically tested it to understand executive adoption of result based management within Canadian federal government [40,41]. Furthermore, Grimsley and Meehan [17] developed an evaluative design framework for electronic services based on public value framework and empirically validated the framework hypothesis on two case studies in UK. Similarly, Kearns [22] developed an analytical framework based on public value framework (services, outcome and trust) to evaluate the impact of electronic services. In a nutshell, it is observed from these few empirical studies that public value can be tested in term of services, outcomes and trust and can be used as a lens to examine different concepts. As illustrated in Fig. 1, this study will further develop public value literature and use it as a lens to understand the impact of Social Media applications in generating public value when used in a local government context.

The value created by service for users are very similar to the benefits attained from purchasing services from private sector. Services value can be achieved through cost effective provision of high quality services [23]. Kearns [22] highlighted five underlying factors that influence the perception of high quality services. These are service availability, satisfaction of services, importance of services offered, fairness of service provision and cost. Moreover, Kelly et al., [23] observed that user satisfaction is an important determinant of creating value in services and user satisfaction is formed by implying factors including: customer service, information, choice and use of services. In addition, Grimsley and Meehan [17] found that satisfaction has great impact on creating service value. It is evident from these studies that citizen satisfaction plays a huge role in maintaining value through services. The second component of public value identified by Kelly et al. [23], is the achievement of the desired outcomes or end results from public services. The value of outcomes is experienced individually by a user who

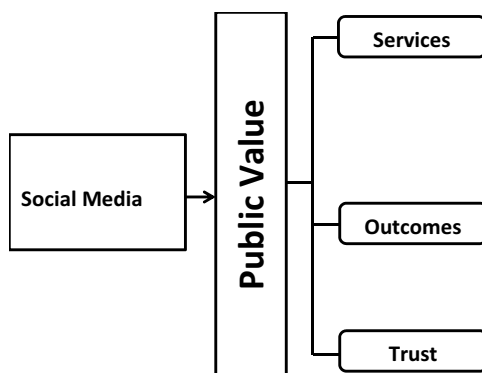


Figure 1. Public Value of Social Media.

is directly using the services and collectively by citizens as a community who have never personally used the services directly [17]. The public expect better outcomes from government in areas such as peace and security, poverty reduction, public health, high employment, low crime rates, clean streets, an improved environment and better educational achievements. These outcomes may overlap with services; however, services and outcomes are clearly different and should be managed separately by public managers [23]. The third component of public value is trust and it is highly valued by the public. Public managers should maintain a high level of trust between citizens and government as it is the heart of relationship between them [22]. For example, if the level of trust in public organisations increases over time, then citizens are most likely to accept government actions. A failure of trust will effectively destroy public value even if improved services or outcome targets are met [23]. Trust in government can be determined in three main ways; firstly the way politicians behave and public organisations behave, secondly the way government manages its economy and deliver services, thirdly the general level of social trust and trust in public organisations.

4. Research Design

The philosophy of research adapted for this study draws on the suggestions of Yin [47], and follow an interpretive, qualitative approach. In this respect, the research approach combined the review and synthesis of literature with a secondary analysis of a social media initiative case in the UK. Firstly, due to the emerging nature of the field of research, a comprehensive and broad literature review was needed to investigate the phenomenon of social media and public value theory. This literature review enabled to scope the defined area of research and identify the void in literature and issues surrounding public value theory as a concept. Then, the case analysis helped determine the role of social media in creating public value. The revelatory case of Love clean street initiative was adopted for this research as the use of social media in public sector especially local government is only an emerging phenomenon. Furthermore, single case study is adopted as it is ideal for revelatory cases where an observer may have access to a phenomenon that was previously inaccessible [47].

5. Case Study: The ‘Love Clean Streets’ Initiative

The London Borough of Lewisham (LBL) has for many years been at the forefront of using ICT and Internet or mobile based applications for engaging with citizens for a range of local community and neighbourhood issues. Using social and mobile media, citizens can interact with the council to report antisocial behaviour such as fly tipping, graffiti and hate crimes as well as other concerns that may affect neighbourhood safety and wellbeing such as animal fouling, dead animals, empty properties etc. LBL intensified their efforts to use social media and related applications particularly in the two years leading up to the London Olympics in 2012 with a ‘Love Clean Streets’ initiative, from January 2010 to January 2012. The objective of the ‘Love Clean Streets’ initiative was for LBL to become a social-networking hub for London and help deliver an environment that reflects London as a world class city for the 2012 Olympics and beyond. By doing so, LBL was aiming to empower residents, council staff, local businesses, NGOs and politicians to engage in their local environment by uploading photos and other information via smart phones or other devices and to participate in debates with peers and civil servants in relation to keeping London’s streets clean. Through the use of ICT, social and mobile media, LBL intended to provide a robust way for local authorities to process information relating to local streets and deal with it on a real time basis, while at the same time keeping the public informed of progress. This was facilitated through links with and sharing existing data through a public Application Programming Interface (API).

From a public value perspective, in pure financial terms, the council has made significant savings as a service provider and the citizens have seen an increase in the way services are delivered and local community issues are dealt with. The reported investment in the ‘Love Clean Streets’ initiative is around £200,000. This compares with benefits recorded so far of: 87% reduction in time taken to process a case; 70% reduction in report handling costs (telephone handling per case costs on average £5.10, compared to £4.10 for web forum and smart mobile with photo £1.50); 21% reduction in environmental casework; 30% increase in resident satisfaction; more than fourfold decrease of land at unacceptable standard; 73% reduction in graffiti; graffiti removal time reduced from average of 2.78 days to less than 0.5 days; fly-tip removal time reduced from average of 2.5 days to less than 1.0 day; elimination in staff overtime to collect missing rubbish bins from £300,000 in 2006 to £0 today; saving of £17,500 by replacing physical inspection with mobile application; and increased trade waste income of £20,000, etc. [12,24,25,27].

In addition to the financial benefits and improvements to services, LBL has significantly increased citizens’ engagement with the policy making processes at the council. For instance using a number of methods, including email and twitter citizens are able to consult local council members with their suggestions or questions/problems that need addressing. Key issues raised by citizens during such consultations are made available through the council public forums so that citizens can track the progress. In terms of social media, citizens have the opportunity to follow the council using Twitter and as of 10 April 2014, LBL had 3968 tweets and more than 10,000 followers. In addition, the council’s Facebook site is liked by more than 1000 users and offers an open platform for local citizens and other stakeholders such as local businesses and NGOs to engage with council workers. A review of the Facebook site for LBL indicates that a wide range of issues are discussed and opined upon covering themes from welfare, social benefits, housing, childcare and schooling to environment and planning and socially

innovation through community participation in car sharing to providing shelter for the homeless.

6. Discussion

Public Value theory has emerged within the public policymaking debate where it encourages public participation and engagement. Social media tools are used by government organisations to create public value through engaging citizens. A review of literature suggests that public value generated through any government initiative should be evaluated in term of services, outcomes and trust. The Love Clean Streets Initiative by the London Borough of Lewisham used social media tools to engage citizen within their local council. The love clean streets initiative has created service value through citizen satisfaction. Citizens are satisfied as it has provided them a choice of reporting environmental crime by using mobile phones and through social media tools or via the council website [24]. As a result, it makes it easier for citizens to report issues that affect them and freely interact with their local council using any method which is convenient for each individual user. Furthermore, the clean street initiative ensures that council residents are satisfied by improving customer services. While previously the council took three days to remove graffiti, now it takes less than a day after a report is filled through any of the different methods [25]. These figures indicate that since 2005 the clean-up rate has significantly improved by 87 per cent and the proportion of residents rating the street cleaning service as 'good' or 'excellent' has increased by 18 per cent [25]. Therefore, it is evident that public value is created through providing efficient and effective customer services.

The love clean streets initiative has also created value through achieving the desired outcomes of the citizen within their local council. It has provided better outcomes in term of reducing the level of crime in the community, improving public health by reducing the risk of public ill health through keeping the environment clean, improving peace and security through citizens' involvement in reporting any suspicious act in the neighbourhood and improving the environment of the local community as whole [12,24,27]. The love clean street initiative has reduced the number of environmental crimes, for example the council is preventing those committing graffiti in advance before it happens. The figures indicate that graffiti in the council of Lewisham fell by 73 per cent from 2006 to 2010 [25]. The Love Clean Street enables two-way interaction with the service and citizens can report local environmental degradation and the council then provides information on how it has responded on each individual report. In this respect, citizens can monitor progress of any issues and in return it increases the level of citizens' trust in their local council [12]. The amount of reports made via love clean street initiative has increased from 1,140 in 2003 to over 6,500 in 2007 [25]. Furthermore, the increase in citizen's satisfaction and the achievement of desired outcomes has no doubt contributed to improving trust [17,23]. In a nutshell, the London Borough of Lewisham has used social and mobile media in the case of love clean streets initiative and in return it has helped the council to generate value through achieving better services, outcomes and trust. Table 1 highlights how public value is generated through the use of social media initiative by a local government authority in the UK.

The table below presents the key drivers for the use of social media by the council and the creation of public value for the users of this initiative in terms of services, outcomes and trust. Thus, highlighting the need for such social media initiatives to create

Table 1. Public Value of Social Media: Case Study Analysis

Case Study Analysis: The ‘Love Clean Streets’ Initiative by The London Borough of Lewisham (LBL)			
Drivers for using Social Media	Public Value		
	Services	Outcomes	Trust
<ul style="list-style-type: none">– Better citizen engagement (two-way interaction)– Improve citizen satisfaction– Speed of Dissemination– Allow for greater transparency– Enhance Trust between citizens and public authority	The initiative adds value to the services offered by the council through the result of citizen satisfaction achieved by providing efficient and effective customer services through its social media platforms. For instance, the clean street initiative ensures that the citizens are satisfied as it provides them a choice of reporting environmental crime by using mobile phones and through social media tools or via the council website.	The outcome value of the initiative is the achievement of social and economic benefits for both the community and the council in the long run. The initiative allows for better outcomes by enabling citizen participation in reporting issues through Twitter and Facebook thereby reducing the level of crime in the community, improving public health by reducing the risk of public ill health through keeping the environment clean, improving peace and security through citizens’ involvement in reporting any suspicious act in the neighborhood and improving the environment of the local community as whole.	The citizen perception of trust in government authorities is likely to increase as a result of the availability of this initiative and allowing two-way interaction between citizens and the council and thereby improving transparency. For instance, allowing citizens to report local environmental degradation and the council then providing information on how it has responded on each individual helps increase citizen satisfaction and the achievement of their desired outcomes contributes to improving trust.

public value for users and if the use of these modern technologies are to be effective among the citizens and help enhance the services offered by public authorities.

7. Conclusions

This research has investigated the evolution of ICT in the UK public sector through a comprehensive literature review and secondary sources. It found a radical shift in the delivery of public services in the UK during the past three decades. In addition, most of the UK public sector transformation efforts in recent years have been enabled though the use of ICT and in particular online and mobile services. The paper highlights the use of social media within a local government context in UK’s Public sector and the benefits obtained thereby. Moreover, this paper has argued that the public sector has been evaluating its ICT projects through using outdated private sector principles which focus on cost efficiency and ignoring other important outcomes desired by the public. Therefore, a public value lens was used to overcome this limitation and validated through a secondary case study of “Love Clean Streets” social media initiative by the Lewisham Council in the UK. This study found that the use of social media applications within the local council has helped in creating public value in terms of services, outcomes and trust. Theoretically, this paper has contributed to the field of public value

theory and social media applications by developing a theoretical lens for evaluating the impact of social media on value creation. From a practical perspective, this paper offers policy makers a high-level reference to understand how social media applications can generate value for citizens. The findings and discussion presented in this study need to be interpreted with the limitation in mind that the results emerged from one initiative in a large council in the UK which was obtained through secondary research. Therefore, any attempts to generalise these findings should be made with caution and preferably after more research is done to empirically explore the results. In this respect, future research is planned to empirical investigate the public value of social media application using several empirical case studies.

References

- [1] Alford, J. and Hughes, O. (2008). 'Public Value Pragmatism as the Next Phase of Public Management', *American Review of Public Administration*, 38, 2, 130–148.
- [2] Alford, J. and O'Flynn, J. (2009). 'Making Sense of Public Value: Concepts, Critiques and Emergent Meanings', *International Journal of Public Administration*, 32, 3–4, 71–91.
- [3] Barberis, P. (1995). The Civil Service from Fulton to Next Steps and Beyond – Two Interpretation, Two Epistemologies, *Public Policy and Administration*, 10, 2, 34–51.
- [4] Benington, J. (2009). 'Creating the Public in Order to Create Public Value?' *International Journal of Public Administration*, 32, 3–4, 232–249.
- [5] Bovaird, T. and Russel, K. (2007). Civil Service Reform in the UK, 1999–2005: Revolutionary Failure or Evolutionary Success? *Public Administration*, 85, 2, 301–328.
- [6] Christensen, T. and Lægreid, P. (2007). 'The Whole-of-government Approach to Public Sector Reform', *Public Administration Review*, 67, 6, 1059–1066.
- [7] Cabinet Office (1983). Financial Management in Government Departments (Cm. 9057), London, HMSO.
- [8] Cabinet Office (1991). The Citizen's Charter: Raising the Standard (Cm. 1599), London, HMSO.
- [9] CIO Council (2009). Guidelines for secure use of social media by federal departments and agencies. CIO P 2106.2. http://www.majorcities.org/generaldocuments/pdf/us_government_guidelines_for_secure_use_social_media_2009.pdf.
- [10] Coats, D. and Passmore, E. (2008). Public Value: The Next Steps in Public Service Reform. London: Work Foundation.
- [11] Cordella, A. and Bonina, C.M. (2012). 'A public value perspective for ICT enabled public sector reforms: a theoretical reflection', *Government information quarterly*, 29, 4, 512–520.
- [12] Data.gov.uk (2012). Love clean streets Case Studies. Available at <http://data.gov.uk/library/love-clean-streets> (Accessed: 01/05/2013).
- [13] Davis, T. and Mintz, M. (2009). Design features for the social web: The Arcquitecture of Deme. Proceedings of 8th Int'l Workshop on Web-Oriented Software Technologies.
- [14] Dunleavy, P., Margetts, H., Bastow, S. and Tinkler, J. (2005). 'New Public Management is Dead – Long live Digital-Era Governance', *Journal of public Administration Research and Theory*, 16, 467–494.
- [15] Flynn, N. (2007). Public Sector Management, 5th edition, London, Sage.
- [16] Greer, P. (1994). Transforming Central Government The Next Steps Initiative, Open University Press, Buckingham, Philadelphia.
- [17] Grimsley, M. and Meehan, A. (2007). 'E-Government Information Systems: Evaluation-led Design for Public Value and Client Trust', *European Journal of Information Systems*, 16, 134–148.
- [18] Hanna, N.K. (2011). Transforming Government and Building the Information Society, Springer New York Dordrecht Heidelberg London.
- [19] Hood, C. (1991). 'A public management for all seasons?' *Public Administration*, 69, 1, 3–19.
- [20] Hood, C. (1995). 'The "New Public Management" in the 1980s: variations on a theme', *Accounting, Organizations and Society*, 20, 2/3, 93–110.
- [21] Huijboom, et al. (2009). Public Services 2.0: The Impact of Social Computing on Public Services, edited by Punie, Y., Misuraca, G., Osimo, D., JRC-IPTS EUR 2408 EN, Luxembourg: European Communities. Available at <http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2820>.
- [22] Kearns, I. (2004). Public value and e-government, Institute for Public Policy Research.

- [23] Kelly, K., Mulgan, G. and Muers, S. (2002). *Creating Public Value. An Analytical Framework for Public Service Reform*. London: CabinetOffice.
- [24] Love clean streets. Available at <http://lovecleanstreets.org/help/about> (Accessed: 01/05/2013).
- [25] Love clean street case study. Available at <http://moreforless.reform.co.uk/pdfs/LoveCleanStreets.pdf> (Accessed (01/05/2013)).
- [26] Metcalfe, L. and Richards, S. (1992). *Improving Public Management*, 2nd edition, London, Sage.
- [27] Microsoft (2012). Case studies. Available at http://www.microsoft.com/canada/casestudies/Case_Study_Detail.aspx?casestudyid=4000011112 (Accessed: 03/05/2013).
- [28] Morrell, K. (2009). 'Governance and the Public Good', *Public Administration*, 87, 3, 538–556.
- [29] Moore, M. (1995). *Creating public value*. Cambridge, MA: Harvard University Press.
- [30] O'Flynn, J. (2007). 'From New Public Management to Public Value: Paradigmatic Change and Managerial Implications', *Australian Journal of Public Administration*, 66, 3, 353–366.
- [31] O'Reilly, T. (2007). What is Web 2.0: Design patterns and business models for the next generation of software, *Communications & Strategies*, 65, 17–37.
- [32] Osborne, S. (2006). The New Public Governance? *Public Management Review*, 8, 3, 377–387.
- [33] Oughton, J. (1994). Market Testing: The Future of the Civil Service, *Public Policy and Administration*, 9, 2, 11–20.
- [34] Pollitt, C. (1993). *Managerialism and the Public Services*, 2nd edn. Oxford: Blackwell.
- [35] Pollitt, C. and Bouckaert, G. (2011). *Public Management Reform: A Comparative Analysis*, 3rd edn. Oxford: Oxford University Press.
- [36] Snead J.T. (2013). Social media use in the U.S. Executive branch, *Government Information Quarterly*, 30, 1, 56–63.
- [37] Stoker, G. (2006). 'Public Value Management: A New Narrative for a Network Government? *American Review of Public Administration*, 36, 1, 41–57.
- [38] Theakston, K. (1995). *The Civil Service Since 1945*: Blackwell.
- [39] Thomson, P. (1992). *Public Sector Management in a Period of Radical Change: 1979–1992*, Public Money & Management, July–Sep.
- [40] Try, D. (2008). "'Mind the Gap, Please": Using Public Value Theory to Examine Executive Take-up of Results-based Management', *International Journal of Productivity and Performance Management*, 57, 1, 22–36.
- [41] Try, D. and Radnor, Z. (2007). 'Developing and Understanding of Results-based Management through Public Value Theory', *International Journal of Public Sector Management*, 20, 7, 655–673.
- [42] Weerakkody, V., Janssen, M. and Dwivedi, Y.K. (2011). 'Transformational change and business process reengineering (BPR): Lessons from the British and Dutch public sector', *Government Information Quarterly*, 28, 320–328.
- [43] Williams, I. and Shearer, H. (2011). 'Appraising public value: past, present and futures', *Public Administration*, 89, 4, 1367–1384.
- [44] Sivarajah, U., Irani, Z., and Jones, S., (2014). 'Application of Web 2.0 Technologies in E-Government: A United Kingdom Case Study,' *System Sciences (HICSS)*, 2014 47th Hawaii International Conference on, pp. 2221–2230, 6–9 Jan. 2014. doi: 10.1109/HICSS.2014.280.
- [45] Nam, T. (2012). "Suggesting frameworks of citizen-sourcing via Government 2.0", *Government Information Quarterly*, 29, 1, 12–20.
- [46] Meijer, A. and Thaens, M. (2010). "Alignment 2.0: Strategic use of new internet technologies in government", *Government Information Quarterly*, 27, 2, 113–121.
- [47] Yin, R.K. (2009). *Case Study Research: Design and Methods*, SAGE.

User Experience as a Personalized Evaluation of an Online Information System

Margit SCHOLL

University of Applied Sciences Wildau, Hochschulring 1, 15745 Wildau, Germany

Abstract. While online information systems and platforms are being increasingly used, user expectations or the specific demands that come out of the usage context have received scant attention in previous developments. Therefore a finely structured, analytical instrument for evaluating information artefacts with specific emphasis on actors and usage was implemented in the Moodle learning platform for Moodle course room evaluation and tested with different student groups. Some surprising results came out of the discussion between the instructor and students. Moreover, this instrument, TEDS*MOODLE, can be scaled and flexibly customized and thus also integrated into existing e-government services and administrative networks.

Keywords. User experience, information systems, learning systems, information artefacts, Moodle course room evaluation

Introduction

User experience is a concept that covers the total effect of all the elements of an IT system on the user. As Eilermann has made clear [1], the range of interactive possibilities can be extremely diverse. Technical factors at the information system (IS) end are also crucial, while the user expectations or the specific demands that come out of the usage context have received scant attention in previous developments. In order to increase acceptance of online information systems in general and Moodle learning platforms with services in particular – which can be seen as “information artefacts” (IA) – the TEDS framework [2] was implemented into our Moodle system. The methodological background, including our original research questions, is outlined in [3]. The developed TEDS*MOODLE application activity was fully operational in the winter semester 2013–14, complete with didactical and technical support. It was in place in various courses with forty students from the Administration and Law department tested: it was tested for both the Moodle course rooms and two online learning courses, in student projects and supplemented by opinion papers submitted by the students. The student evaluations both of the Moodle course rooms and the online learning courses with the TEDS*MOODLE activity were, however, voluntary and, as a result, had varied participation rates. In this paper the results of three Moodle course room evaluations are summarized.

Based on the TEDS framework policy of discussing the assessment results with the users as evaluators [2,3], we were able to make improvements to our application activ-

ity. More importantly, these empirical results show how individual informational offerings can be evaluated in a user-oriented fashion and duly enhanced. Our specific research questions (RQ) in this part of the project are as follows:

- RQ#1 Is the implemented application TEDS*MOODLE self-describable and easy to use for course room evaluation?
- RQ#2 Are the categories and criteria of the evaluation for users (voters) sufficiently understandable and differentiable?
- RQ#3 What didactic and technical support is necessary to establish TEDS*MOODLE as a continuously usable evaluation method?

In Chapter 1 the literature background for the TEDS framework and the implementation of TEDS*MOODLE is shown. Chapter 2 deals with the evaluated Moodle course rooms and their results. Their individual results are summarized in Chapter 3 and in Chapter 4 an outlook for continued use of this delicate evaluation tool is given. At the same time concrete suggestions might be made on ways to improve e-Government services. These refinements are made possible through the inclusion of members of the public and their interaction with electronic systems. So, at the end of the paper, an outline answer will be offered to the question of how, in a similar way to the students of Administration and Law, citizens can become active co-designers in this kind of service provision and experience the transparency and comprehensibility they require when using IS. In turn, this helps fulfil the essential requirements of teaching and learning, which are today also associated with the area of e-Government and in particular with electronic service provision in administrative networks [4].

1. Literature Review and the Background of TEDS*MOODLE

While online information systems and platforms are being increasingly used in learning processes within a wide range of disciplines, this increase has often not been actively matched, in and of itself, by user acceptance, participation, collaboration, and co-design. The development is often generally done “for” and not “with” the user. The acceptance and use intensity of new media, which were originally strongly driven by technology, are now being increasingly explored with a view to advancing the action-oriented and self-directed learning of users [5]. Didactic scenarios and gender-sensitive didactic approaches are becoming increasingly important [6–9], and social media also play an innovative part in e-Government [10]. However, despite the fact that there are first methodological approaches to evaluate Open Government Data Infrastructure [11], there have been few approaches to an understanding of what values can be generated [12,13]. Our focus here is on the various needs of the users, particularly when it comes to the question of their motivation in grappling with information and learning systems (see also [4]). From this perspective, technical systems and learning platforms are also turned into sensitive instruments of intentional social intervention (cf. [14,15]).

This is where the original TEDS framework [2] comes in, which was published in 2011 and based on Taylor’s [16,17] criteria for evaluating human needs when dealing with IT. The TEDS framework has developed these criteria further on, presenting a finely structured, analytical instrument for evaluating information artefacts with specific emphasis on actors and usage. The TEDS framework approach is amenable to any kind of “information artefact”, be it a book, newspaper, TV ad, website, document, or an information system in its entirety. The TEDS framework has been used to evaluate

the websites of professional sports teams (cf. [18,19]). It can also be used in the analysis of social media and mobile information artefacts [20].

In our case the TEDS framework was integrated and electronically implemented into our Moodle learning platform in a purpose-customized way as a Moodle “activity” [3]. For this specific integration we use 33 criteria from the original 40 evaluation criteria, however the implementation is flexible and could be changed if necessary. We call our solution TEDS*MOODLE, which is so far the only one of its kind and is intended to be used firstly for course site evaluation and content evaluation, however, one is free to choose another object of investigation. The TEDS*MOODLE integration concept and interfaces are shown in [3]. Particular care is needed in the integration of the TEDS framework in the Moodle learning platform in order to give future users (evaluators) access to the methodology and the used categories that is simple and self-explanatory. For this purpose concrete user questions have been developed for each criterion (see Fig. 1 in English; see [21] for German) and, with their help we hoped, users can easily understand the fine sense of the TEDS*MOODLE evaluation. Moreover, multilingual capabilities are implemented for future target groups in order to make the process more comprehensible. In this initial implementation, the languages German, English, and Spanish were chosen.

Like the TEDS framework, the TEDS*MOODLE integration that we have derived from it is not limited to the academic sector and should be viewed simply as a preliminary area of concrete application. Elsewhere [3,21], we go into the demands and challenges associated with the integration of the TEDS framework into the MOODLE learning platform and demonstrate our integration solution as a concrete contribution to the further development of applications. Here results of the evaluations of three Moodle course rooms are presented.

2. Application of the Methodology: Case Studies and Results

A course with forty students from the Administration and Law department (first semester) were informed about the methodology of the TEDS framework. Like the original TEDS framework [2], TEDS*MOODLE contains the following steps, which then build on one another:

- The identification of “personae” with their concrete wishes, needs, values, and belief systems. Personae describe groups of actors operating within same contexts and information environments and having similar requirements.
- The identification of specific scenarios and their utilization as hypothetical archetypes of contextualized human activity.
- The evaluation of an IA in accordance with the six main categories and thirty-three sub-categories, which need to be largely self-explanatory for those taking part in the evaluations.
- Discussion of the results and the drawing up of detailed recommendations for improving the design of the IA being tested.

According to the TEDS framework, the first step is to determine what should be evaluated as an IA. Another key step is to find a reference IA, an “anchor”, that can be used as a basis for meaningful comparison in the actual assessment and as a means to “practice” the evaluations. The anchor could be the website of another equivalent



E-Learning Technische Hochschule Wildau



survey VR13 TEDS-Evaluation Informationsartefakt 2: Kursraum Aufbau- und Ablauforganisation from Margit Scholl

summary of the survey

- create evaluation file
- Show graphical analysis
- create evaluation file (OpenOffice)
- create evaluation file (Microsoft Office)

Save

assessment	category name	category description
<input type="text" value="neutral"/>	Browsability	Could you find what you were looking for?
<input type="text" value="fully agree"/>	Formatting	Was the formatting and presentation of information user friendly and easy to understand?
<input type="text" value="fully agree"/>	Medation	Can the information be clearly navigated?
<input type="text" value="tend to agree"/>	Accessibility	Is it easy to reach the desired information or functionality?
<input type="text" value="tend to disagree"/>	Simplicity	Is the information presented in a straightforward manner?
<input type="text" value="neutral"/>	Item identification	Is it possible to recognize information unproblematically?
<input type="text" value="fully disagree"/>	Subject description/ Classification	Is information easy to find?
<input type="text" value="tend to agree"/>	Subject Summary / Summarization	Is the information clearly and concisely summarized?
<input type="text" value="tend to agree"/>	Linkage / Referral	Are there functioning links to other information sources outside the information artifact?
<input type="text" value="tend to agree"/>	Precision of search	When searching for specific information, are the results sufficiently precise?
<input type="text" value="tend to agree"/>	Selectivity	Is it easy to select specific information?
<input type="text" value="tend to agree"/>	Novelty	Do you trust that the information you select is up to date?
<input type="text" value="tend to disagree"/>	Accuracy	Do you consider the information to be free of errors?
<input type="text" value="tend to agree"/>	Comprehensiveness / Completeness	In your opinion, is the information complete?
<input type="text" value="tend to agree"/>	Validity / Reliability	Do you rate the information as reliable?
<input type="text" value="tend to agree"/>	Authority	Do you find the information trustworthy?
<input type="text" value="tend to disagree"/>	Feedback	Is it possible to give feedback?
<input type="text" value="tend to agree"/>	Contextuality / Closeness to Problem	Is the information relevant to your current problem?
<input type="text" value="tend to disagree"/>	Flexibility	Are you able to flexibly customize the information?
<input type="text" value="tend to agree"/>	Simplicity	Is it easy to adjust the way the information is presented in the information artifact?
<input type="text" value="neutral"/>	Transaction	Is there a direct transaction function available when required for purchasing goods and products?
<input type="text" value="tend to disagree"/>	Trust on adaptability	Can you be sure that your customizations will be saved?
<input type="text" value="neutral"/>	Community	Do you have forums available that you can make free use of?
<input type="text" value="neutral"/>	Individualization	Can you tailor the way information is presented to meet your individual requirements?
<input type="text" value="neutral"/>	Localization	Can you adjust the information display for different time zones, languages, or cultural circumstances?
<input type="text" value="tend to disagree"/>	Privacy	Do you have information to help you find out how to secure and protect your data?
<input type="text" value="tend to agree"/>	Cost / Time savings	Does the information help you to save time/money?
<input type="text" value="neutral"/>	Security / Safety	Is the information made available in a secure way?
<input type="text" value="neutral"/>	Aesthetics	Is the design attractive?
<input type="text" value="tend to agree"/>	Entertainment	Do the entertainment elements in the information presentation encourage you to stay longer?
<input type="text" value="neutral"/>	Engagement	Are you persuaded by the way the information is presented? Does it make an attempt to win you over?
<input type="text" value="tend to agree"/>	Stimulation	Does the presentation of the information inspire you to undertake your own activities?
<input type="text" value="neutral"/>	Satisfaction	Do you have a sense of satisfaction after retrieving information?

Save

Figure 1. The evaluation activity TEDS*MOODLE of the Moodle learning platform at the University of Applied Sciences (UAS) Wildau.

learning platform and is identified as outstanding (positive anchor) or poor (negative anchor). TEDS*MOODLE distinguishes the following six main evaluation categories: Ease of Use, Noise Reduction, Quality, Adaptability, Additional Performance Features, and Affection. The adaptation process reduced the number of sub-categories from the original forty to a total of thirty-three assessment criteria. The TEDS*MOODLE evaluation was set up according to a *German-style* Likert scale: “Strongly agree” (1), “Agree” (2), “Neither agree nor disagree” (3), “Disagree” (4), “Strongly disagree” (5).

2.1. Course Room Evaluation

In order to identify variances and assessment discrepancies, all the student evaluations were statistically analyzed. After the evaluation, lecturers and students discussed any variances, thus consolidating the basis for comparison. An *iterative* research process was applied, whereby the questions developed within the TEDS*MOODLE framework, which were designed to clarify the purpose of the individual assessment categories, were simplified and refined after the initial evaluation of the anchor (cf. [3,4,21]). The evaluation of the selected IA was then carried out using a Likert scale. These evaluations were also statistically analyzed and any variances were pointed up. This was followed by a new discussion of the variances, which then led to a final appraisal of the results. To conclude the process, the strengths, weaknesses, and problems were discussed and detailed recommendations for improving the IA were generated and documented.

2.2. “e-Government” Course Room

It is important to note that the students are not evaluating people with the TEDS method but rather collaboratively and interactively designed Moodle course rooms, in other words IAs with specific higher educational qualities. A Moodle course room for the lecture on e-Government that could be walked through from top to bottom was the first IA to be evaluated. It was divided up into the main areas of Communication, Organization, Course Resources, Lecture/Course Materials, and Tutorials, Assignments, and Exam Preparation. The most comprehensive section Lecture/Course Materials contains posts sorted according to topic in the form of PDF files, as well as links and videos. While at the beginning, the content, history, and terminology relating to e-Government is explained, the e-Government section includes Germany’s national e-Government strategy along with relevant legislation. The other sections are Project Management, IT Security, and Modern Citizen Services as a specialization. Related to this, the section Tutorials includes, for example, a link to a current issue (reducing the administrative load on parents) and practice tasks on IT security.

As shown in Fig. 2 Community (criterion 23) with the question “Do you have forums available that you can make free use of?” was positively rated, the best criterion of all, and only few students didn’t agree. However, this category covers the usability of forums – this always requires additional input from the instructor to provide feedback independent of time and place. In contrast the criterion 24 (Individualization/adaptability) with the question “Can you tailor the way information is presented to meet your individual requirements?” is rated almost the worst. This is not surprising since in essence students were not provided with any self-directed activities relating directly to Adaptability as part of rights management of the Moodle course room –

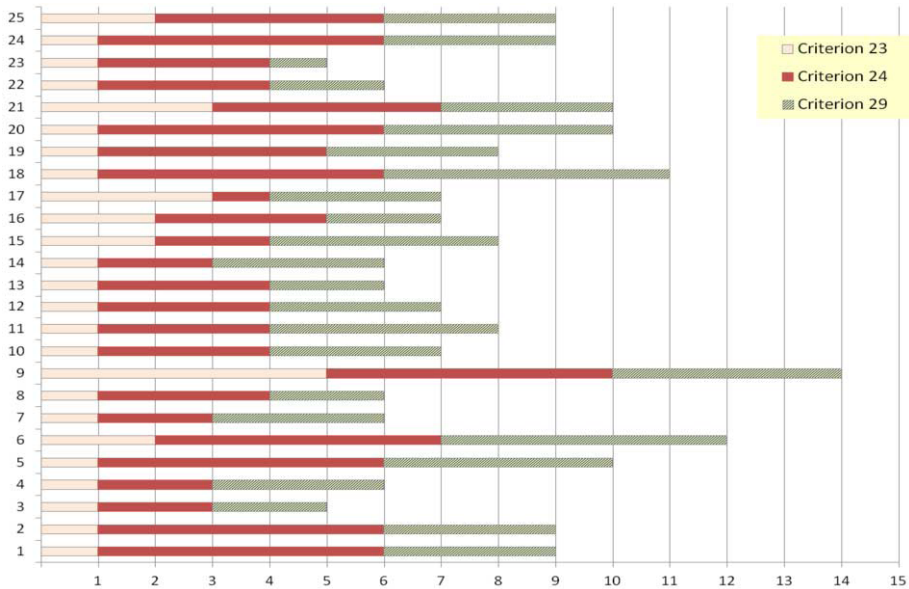


Figure 2. TEDS*MOODLE evaluation from 25 students of the first semester: Average values for the criterion 23 “Community/forums”, criterion 24 “Individualization/adaptability” and criterion 29 “Aesthetics/design”. German-style Likert scale: “Strongly agree” (1), “Agree” (2), “Neither agree nor disagree” (3), “Disagree” (4) and “Strongly disagree” (5).

the administrators of the Moodle platform do not allow this. As an example for a neutral evaluation in average the Aesthetics (criterion 29) is shown that treats the question “Is the design attractive?”. Contrary to the developers of the Moodle course room this neutrality is quite a potential for an improvement of the design.

2.3. “Administrative Modernization” Course Room

Administrative Modernization was the second Moodle course room to be evaluated by students. Apart from the final section, which is a collection of student projects, it has a similar formal structure. However, the course materials here include information on the organization of public administration, on project and process management (the selection of business processes, process analysis) and on document management and workflow systems, in particular the EL.DOK system used in Brandenburg. The Tutorials section includes tasks on electronic process organization and on process modelling. The student projects bring together topics like procurement procedures, registration, planning applications, or the description of summary proceedings.

The results of both course rooms exhibit a high degree of satisfaction with the various aspects of Ease of Use, although there is scope for improving Searchability, increasing Simplicity, and optimizing Mediation with regard to Accessibility. In the second main category, Noise Reduction, Novelty had the best score, followed by Item Identification. Conversely, poor scores were registered for discoverability, summarization, and precision. As the discussion revealed, this is partly due to the difficulty of knowing how to gauge the informational content in this phase of the programme (first semester). The third category, which covers quality criteria, gained unequivocally posi-

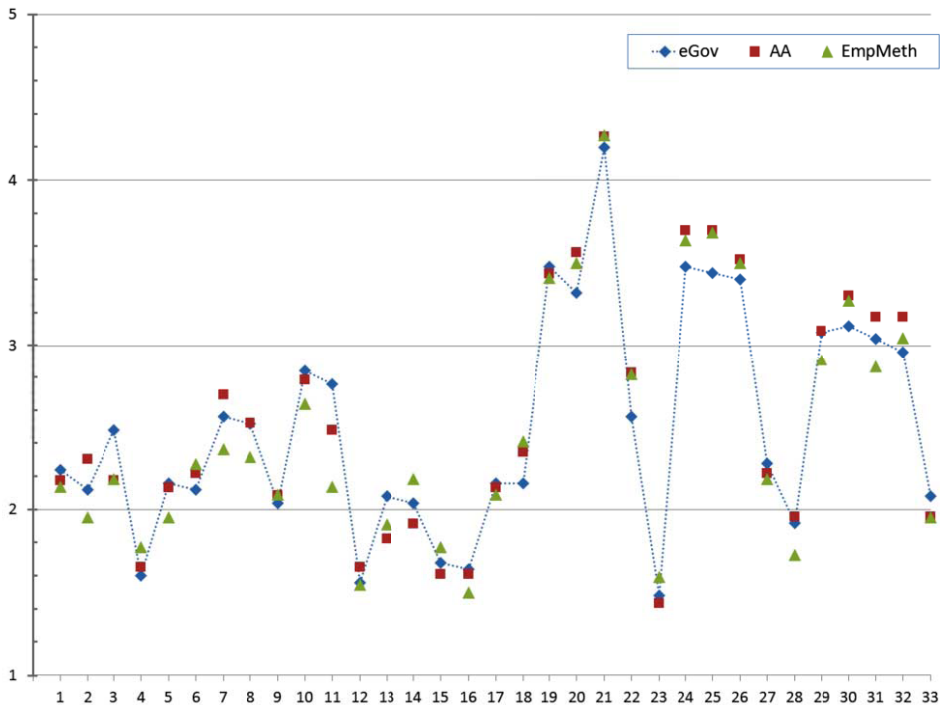


Figure 3. TEDS*MOODLE evaluation for the three Moodle course rooms “e-Government” (♦), “Administrative Modernization” (■) and “Empirical Methods” (▲); average value for each of the thirty-three assessment criteria according to a *German-style* Likert scale: “Strongly agree” (1), “Agree” (2), “Neither agree nor disagree” (3), “Disagree” (4) and “Strongly disagree” (5).

tive ratings overall. However, discussion showed that the good results in the areas Accuracy, Comprehensiveness, Currency, and Authority can be explained by confidence in the content posted by the lecturer. As shown above the worst assessments tended to come in the main category Adaptability. In the category Additional Performance Features, Safety scored particularly well. However, Cost/Time Savings, which is an important aspect of e-Government, while registering twelve positive ratings, also received a significant number of neutral evaluations. The final main category, Affection, recorded a high level of satisfaction after information retrieval. Set against that, Stimulation, Entertainment, and Aesthetics were given neutral or negative evaluations. In our view this has something to do both with the mundane, matter-of-fact nature of an electronic learning environment and the imperative of needing to deal with its contents – these two factors still need to be researched with regard to e-Government.

2.4. “Empirical Methods” Course Room

The third Moodle course room to be evaluated as an IA shows essentially the same tendencies as the two foregoing courses (see Fig. 3). It is noticeable in all three courses that the first half of the evaluation categories clearly received more positive assessments from first-semester students than most of the categories in the second half. However, the third course room fared better on average in these “poorer” categories. This is also interesting as all three courses have the same basic structure but are characterized

by an abundance of course materials and a variety of Moodle activities. So, the tool was thus used in a differentiated way by the students for their evaluation.

The surprising result coming out of the discussion between the instructor and students was that in the three classes that had different content but which the instructor ran in parallel during the semester with the same seminar group, the course rooms should be consciously differentiated in terms of design, e.g. using different colours, so that distinctive features would register in students' minds. The students of the first semester wanted a clear different, topic-specific layout/design for each course, so that they easily know where they are. This requirement of the students does not correspond to our administrators' opinion who wanted a standardization of all classrooms with the help of templates.

3. Discussion of the Results and Summary

The requirements established by e-Government policy as regards simplicity, transparency, speed, and authority can be seen in the evaluation results – extended to include the fine distinctions we developed. Simplicity and transparency of process are differentially assessed in our categories Ease of Use and Noise Reduction. Trustworthiness is included – again differentially – in the categories Quality and Adaptability. Adaptability, expanded into dimensions like contextuality and community, fosters active involvement and personal interaction. The category Affection also yields differentiated information. Concerning the first research question RQ#1, whether the implemented application TEDS*MOODLE is a self-describable and easy tool for course room evaluation, it is obviously the case.

So far, the evaluation activity TEDS*MOODLE was tested only in German by German students. The changes to the (German) evaluation questions prompted by the discussions with the students that were made by the TEDS@wildau team brought greater clarity on all sides. After these changes the categories and criteria of the evaluation for users (voters) are sufficiently understandable and differentiable (RQ#2). Although we have adjusted the English and Spanish questions accordingly, the author still thinks that the real-world use of TEDS*MOODLE in these languages will lead to necessary cultural improvements being made to the evaluation system. Cultural improvements will also apply to the forthcoming inclusion of key frames for illustrative explanation of the individual criteria.

The use of neutral Likert scale “3” led to some confusion. In the Likert scale it is not possible to explicitly rate something as “non-existent”, something that the vast majority of Administration and Law students would have liked to have had as an option. In their opinion, this would make the evaluation and appraisal of the information systems more meaningful, user friendly, and accurate. However, all in all, after working with TEDS*MOODLE and the TEDS framework methodology, the majority of Administration and Law students discovered for themselves that in future they would take a much more sophisticated view of unfamiliar media. With the current implementation of TEDS*MOODLE a tool is established that does not need much further didactic and technical support to use it as a continuously usable evaluation method (RQ#3). Moreover, it is flexible and easily adaptable.

4. Conclusion and Perspectives

With TEDS*MOODLE we have made it possible to engage – with full didactic and technical support – different target groups in specific user scenarios and involve them in the informed evaluation of e-Government IAs on an ongoing basis. This should contribute to the sustained improvement of these services. In usability terms, TEDS*MOODLE – also independently of Moodle – can be scaled and flexibly customized and thus integrated into existing services and administrative networks.

On the basis of the preliminary empirical results of the TEDS*MOODLE evaluation activity we developed, we can illustrate the possibilities of our integration application. The results of the evaluated Moodle course rooms and the project reports and papers point to other areas of deployment in administrative networks and e-Government and thus address the core need for acceptance in these fields. We interpret these results as showing that citizens want a different kind of communication with administrative systems, the details of which do not conform to expectations. If they are involved as evaluators and co-producers in the design of e-Government IAs (both platforms and their contents), administrations are given concrete indicators as to the limiting and facilitating factors in their information systems. Not every category in the TEDS framework can be directly adapted for administrative networks and e-Government services and some customization will certainly be required. However, it should now be clear that the acceptance of IA and IS can be increased with this flexible and comparatively usable approach, which is both sophisticated and user oriented.

If these challenges are to be met, not only is a higher level of media competence required in all participants but the instruments that are deployed and the interaction between them must also be reviewed. As Büschenfeldt et al. have noted, the term distributed knowledge work refers in this context to an activity that both requires and produces knowledge and is thus defined by the fact of its permanent redefinition [22]. This also points to a continuous survey of users of the IS. Moreover the use of TEDS*MOODLE as a crowdsourcing tool via the Internet needs to be examined: our TEDS*MOODLE integration product could also be used as an IA for e-Government platforms (and their content) with the appropriate administrative services so that these services can be subtly evaluated in terms of specific individual usage areas (scenarios) and defined target groups (personae) as part of a campaign or on an ongoing basis. Valid improvements can then be made. The administration would receive concrete suggestions for enhancing its IAs and citizens would become active co-designers of the informational services. Their needs and knowledge would be put to creative and productive use online.

References

- [1] Eilermann, B.: Nutzungserleben betrieblicher Informationssysteme in der Automobilindustrie. Dissertation, Humboldt-Universität Berlin. AutoUni-Schriftenreihe, Volkswagen AG, Logos Verlag Berlin GmbH (2013).
- [2] Scholl, H.J., Eisenberg, M.B., Dirks, L., Timothy S.C.: The TEDS framework for assessing information systems from a human actors' perspective: Extending and repurposing Taylor's Value-Added Model, *Journal of the American Society for Information Science and Technology*, Vol. 64, No. 4, pp. 789–804 (2011).
- [3] Scholl, M., Ehrlich, P., Wiesner-Steiner, A., Edich, D.: The project TEDS@wildau: TEDS Framework Integration into the Moodle platform for user-specific quality assurance of learning scenarios, *Proceed-*

- ings of the 47th Annual Hawaii International Conference on System Sciences, HICCS 47, 978-1-4799-2504-9/14 IEEE, pp. 1935–1945 (2014).
- [4] Wiesner-Steiner, A., Scholl, M., Ehrlich, P.: Prozesstransparenz, Nachvollziehbarkeit und nutzerorientierte Akzeptanzsicherung in (Verwaltungs-) Netzwerken. In: Schweighofer, E., et al. (eds.): Transparenz, Proceedings of the 17th International Legal Informatics Symposium, 20–23 February 2014, Salzburg, pp. 171–178. Österreichische Computer Gesellschaft & Erich Schweighofer (2014).
 - [5] Dittler, U., Krameritsch, K., Nistor, N., Schwarz, C.: E-Learning: Eine Zwischenbilanz: Kritischer Rückblick als Basis eines Aufbruchs. Waxmann, Münster (2009).
 - [6] Kerres, M., de Witt, C.: A didactical framework for the design of blended learning arrangements, *Journal of Education Media*, Special Theme Issued “Blended Learning”, Vol. 28, No. 2, S. 101–113/ Vol. 28, No. 2–3, pp. 101–113. Routledge, Oxford (2003).
 - [7] Baumgartner, P.: Taxonomie von Unterrichtsmethoden – Ein Plädoyer für didaktische Vielfalt, p. 376. Waxmann, Münster (2011).
 - [8] Tomei, L.: Information Communication Technologies for enhanced education and learning: Advanced applications and developments. Information Science Reference, p. 394. Hershey, New York (2009).
 - [9] Wiesner-Steiner, A., Wiesner, H., Schelhowe, H., Luck, P.: The Didactical Agency of Information Communication Technologies for Enhanced Education and Learning. In: Tomei, L. (Hrsg.) Information Communication Technologies for Enhanced Education, Information Science Reference, pp. 59–76 (2009).
 - [10] Criado, J.I., Rodrigo, S.-A., Gil-Garcia, J.R.: Government innovation through social media. *Government Information Quarterly* 30.4, pp. 319–326 (2013).
 - [11] Ubaldi, B.: Open Government Data: Towards Empirical Analysis of Open Government Data Initiatives, OECD Working Papers on Public Governance No. 22 (2013).
 - [12] Charalabidis, Y., Euripides, L., Charalampos, A.: Evaluating Second Generation Open Government Data Infrastructures Using Value Models, Proceedings of the 47th Hawaii International Conference on System Science, HICCS 47, 978-1-4799-2504-9/14 IEEE, pp. 2114–2126 (2014).
 - [13] Solar, M., Concha, G., Meijueiro, L.: A Model to Assess Open Government Data in Public Agencies. In: Scholl, H.-J. et al. (eds.), Proceedings of IFIP EGOV Conference 2012, LNCS 7443, S. 210–221 (2013).
 - [14] Lessig, L.: Code and other laws of cyberspace. Basic Books, NY (1999).
 - [15] Büschenfeldt, M., Scholl M.: Die Archetypen des Web 2.0 als Referenzmodell für das E-Government 2.0. In: Dekan, FB Allg. Verwaltung HWR Berlin (Hrsg.), Beiträge zur Verwaltungsinformatik, Nr. 19/ 2014, S. 117–139. Ergänzungsband zur GI-Fachtagung “Gemeinsam Electronic Government ziel (gruppen)-gerecht gestalten und organisieren”, March 20–21, 2014, Berlin, Germany (2014).
 - [16] Taylor, R.S.: Value-Added Processes in the Information Life Cycle, *Journal of the American Society for Information Science and Technology*, Vol. 33, No. 5, S. 341–346 / pp. 341–346 (1982).
 - [17] Taylor, R.S.: Value-added processes in information systems. Norwood/NJ, Ablex Publ. Corp. (1986).
 - [18] Scholl, H.J., Carlson T.S.: “Professional sports teams on the Web: a comparative study employing the information management perspective,” *European Sport Management Quarterly*, No. April, pp. 37–41 (2012).
 - [19] Scholl, H.J.: Evaluating Sports Websites from an Information Management Perspective. In: P.M. Pedersen (ed.), Routledge Handbook of Sport Communication, New York: Routledge, S. 289–299 (2013).
 - [20] Scholl, H.J., Wang, K., Wang Y., Woods G., Xu D., Yao Y., Jurisch M., Krcmar, H.: Digital and Social Media in Pro Sports: Analysis of the 2013 UEFA Top Four, 2014 47th Hawaii International Conference on System Science, IEEE, pp. 3073–3082 (2014).
 - [21] Scholl, M., Wiesner-Steiner, A., Ehrlich, P., Edich, D.: Personalisierte Akzeptanzsicherung und benutzerorientiertes Qualitätsmanagement in elektronisch basierten Lehr- und Lernprozessen dargestellt anhand der Evaluationsaktivität TEDS*MOODLE. In: Lück-Schneider, D., Kraatz, E. (eds.), 25 Jahre Glienicker Gespräche, Jubiläumsband, Reihe FHW/HWR Forschung, edition Sigma (2014).
 - [22] Büschenfeldt, M., Scholl, M.: Offene Standards und verteilte Anwendungen als Grundlage “Verteilter Wissensarbeit” (auch) im Open Government. In: TH Wildau, Wissenschaftliche Beiträge, pp. 84–90 (2013).

Posters

This page intentionally left blank

The Project “iBaMs – Barrier-Reduced Machines in Innovative Interaction”

Margit Scholl

University of Applied Sciences Wildau, Hochschulring 1, 15745 Wildau, Germany

Abstract. The project iBaMs funded by the German Federal Ministry of Research and Technology (BMBF) examines the preconditions and requirements for the development of handicapped-accessible operation devices for computer-numeric-controlled (CNC) machines in facilities for mentally disabled people.

Keywords. Barrier-reduced machines, mentally disabled people, smart democratic businesses, integration processes, technical improvements, integrative design, ICT, CNC, organizational changes

1. The role of technology

Just like other societies and their governments and economies, Germany is facing major challenges. Actionable and ubiquitous information, along with its underlying technologies, is an essential prerequisite not only for developing models of smart (democratic) governance that foster agile, open governmental institutions and stakeholder participation and collaboration on all levels and in all branches of the governing process (see [1]) but also for creating smart democratic businesses that integrate disabled persons. So, technical improvements must have an integrative design and be implemented together with changes to organizational processes in the context of an overall system. The economic impact of demographic change coupled with a change in the age structure of society should also lead to better integration of people with disabilities into work processes. Technological innovation should improve their user experience of company information systems.

Moreover, technology is not neutral; technical systems have become an instrument of deliberate and targeted social intervention. In principle, technical action is to be regarded as a socio-technical action [2]. Technologies and software facilitate or restrict human action and affect every individual and society as a whole. This tie-in has already been suggested by US legal academic Lawrence Lessig with his thesis “code is law”. It is his opinion that the code as a regulatory instance, comparable to the law, the market, or social norms, lays down behavioural guidelines [3]. Machines, technology development, information communication technology (ICT) or designed platforms are socio-technical systems that do “act” and affect, give leeway or restrict (see [4]).

2. Mentally disabled persons in the working context

The use of technology for learning or working tasks facilitates and heavily influences

new forms of activities, social rules, and interactions (see [5]; [6]; [7]). Because the use of technology at work is a strong factor in facilitating and influencing new kinds of social rules and forms of interaction and co-determining the possibilities, integration, or isolation of mentally disabled persons, technological innovation in this field requires special attention to ensure a user-centric perspective. Thus the aim of the iBaMs project is to identify the special skills as well as the limitations of mentally disabled persons working with technology.

As described in [8], we also need to reflect on how flexible and adaptable computer-numeric-controlled (CNC) units should be designed for fields like metalworking, carpentry, or semi-automated large-scale catering establishments. Our project thus addresses the development of handicapped-accessible operation terminals for those areas that cater to the different requirements and user perspectives involved in the preparation, starting, and controlling of machines. Because many facilities for the handicapped work in similar fields, we see the potential for adapting and broadening the scope of application of these CNC-controlled units.

3. The iBaMs project

The iBaMs project is a so-called pre-project for one year, running from 1.1.2014 until 31.12.2014. As indicated on the iBaMs project website (see <http://ibams.th-wildau.de>), our overall goal is to achieve better support, empowerment, and control of the workflow stemming from mentally disabled persons working with technology. At the same time, we wish to improve the value creation of facilities for the disabled. In practical terms, this means combining two methodological approaches—one that focuses on the user-centric perspective of mentally disabled persons, and another that deals with the modernizing demands and economic requirements of facilities for the disabled.

We are partnered with CVJM Wesermarsch¹, a well-established organization that employs over 360 people with disabilities and more than 70 qualified staff members in a large area on the German North Sea coast. Together with a highly qualified team, including production and factory managers as well as selected employees, we analyse the user-centric and economic prospects for the development of handicapped-accessible operation terminals, using methods like expert interviews, participative observation, and workshops. These methods are used to address the following research questions (see [8]):

- What is the existing level of experience with human–technology interactions in the different fields of application?
- How could these interactions be improved?
- What is the optimum way to design a user interface in line with the experience, capacities, and limitations of mentally disabled persons?
- How many symbols, knobs, colours, pictures, gesture-control elements, or acoustic signals should a control display have?
- How are these perceived by the mentally disabled?
- How can these perceptions be used to design new technology?
- What kind of technological/pedagogical help is required to maintain workflows and handle any problems that arise?

¹ see <http://sozialwerk-wesermarsch.de>

In answering these questions, the iBaMs project marks the first step towards a more comprehensive three-year research project that will add more partners and result in the concrete design of specific technologies.

Research in Wildau: innovative & practice oriented Prof. Dr. Margit C. Scholl

The Project “iBaMs – Barrier-Reduced Machines in Innovative Interaction”

The economic impact of demographic change coupled with a change in the age structure of society should also lead to better integration of people with disabilities into work processes. Technological innovation should improve their user experience of company information systems.

The project iBaMs—“Barrier-Reduced Machines in Innovative Interaction”—funded by the German Federal Ministry of Research and Technology (BMBF) examines the preconditions and design requirements for touch-screen control panels for mentally disabled persons working with CNC machines.

Although different from humans, machines and technologies do “act”. For mentally disabled persons, we argue that technology and the tools required to work with it also co-produce and co-decide the possibilities for integration, inclusion or isolation, both in terms of social structures and subjective perspectives (that are often experienced emotionally). In consequence, technological innovation in that field requires that special attention be paid to the user-centric perspective. Therefore, iBaMs aims to identify the special skills as well as the limitations of mentally disabled persons working with technology.

iBaMs We are partnered with CVJM Wesermarsch.

Characteristics of the design requirements are based on the general objectives of dialogue design outlined in **DIN EN ISO 9241-110:2008-09**:

- Appropriateness of tasks
- Self-descriptiveness
- Expectation conformity
- Learning encouragement
- Controllability
- Margin of error
- Individualization of tasks

In view of the development of touch-screen operation devices as “instruments of inclusion” it will be necessary to delegate tasks from supervisors and trainers to the display and thus to mentally disabled persons who are able to operate the display.

<https://ibams.th-wildau.de> E-mail: project.manager.margit.scholl@th-wildau.de
 Status: April 15, 2014 Team: Dr. Andreas Wiesner-Steiner, Anja Teske, Frauke Fuhrmann, Dennis Edick

Figure 1. Poster of the iBaMs project at EGOV 2014.

References

- [1] Scholl, Hans J., and Margit Scholl (2014). “Smart Governance: A Roadmap for Research and Practice”. Proceedings of the iConference, 4–7 March 2014, Berlin, Germany.
- [2] Ropohl, Günter (1991). *Technologische Aufklärung: Beiträge zur Technikphilosophie*. Frankfurt am Main: Suhrkamp.
- [3] Lessig, Lawrence (1999). *Code and Other Laws of Cyberspace*. New York: Basic Books.
- [4] Büschenfeldt, Maika, and Margit Scholl (2014). “Die Archetypen des Web 2.0 als Referenzmodell für das E-Government 2.0”. In Dekan FB Allgemeine Verwaltung, HWR Berlin (ed.). *Beiträge zur Verwaltungsinformatik 19*, (2014), pp. 117–39. Supplement for the GI symposium Gemeinsam Electronic Government ziel(gruppen)gerecht gestalten und organisieren, 20–21 March 2014, Berlin, Germany.
- [5] Wiesner-Steiner, Andreas, Wiesner, Heike, Schelhowe, Heidi, and Luck, Petra (2009). “The Didactical Agency of Information Communication Technologies for Enhanced Education and Learning”. In Tomei, Lawrence, ed. *Information Communication Technologies for Enhanced Education and Learning: Advanced Applications and Developments*. Hershey, PA: Information Science Reference, pp. 59–75.
- [6] Degele, Nina (2002). *Einführung in die Techniksoziologie*. Munich: Fink (UTB).
- [7] Rammert, Werner, ed. (2002). *Können Maschinen handeln? Soziologische Beiträge zum Verhältnis von Mensch und Technik*. Frankfurt am Main: Campus.
- [8] Wiesner-Steiner, Andreas, Anja Teske, Frauke Fuhrmann, and Margit Scholl (2014). “Preconditions and Design Requirements for Touch-Screen Control Panels for Mentally Disabled Persons Working with CNC Machines”, 8th Interfaces and Human Computer Interaction (IHCI), 15–17 July 2014, Lisbon, Portugal.

This page intentionally left blank

Workshops

This page intentionally left blank

Workshop on Critical Success Factors for Open Data – From Policy to Participation and Innovation

Iryna SUSHA^{a,b}, Anneke ZUIDERWIJK^b, Marijn JANSSEN^b, Peter PARYCEK^c and Euripidis LOUKIS^d

^a*Orebro University, Fakultetsgatan 1, 701 82 Örebro, Sweden*

iryna.susha@oru.se

^b*Delft University of Technology, Jaffalaan 5, 2628 BX Delft, The Netherlands*
{I.Susha,A.M.G.Zuiderwijk-vanEijk,M.F.W.H.A.Janssen}@tudelft.nl

^c*Danube-University Krems, Dr.-Karl-Dorrek-Straße 30, 3500 Krems, Austria*
peter.parycek@donau-uni.ac.at

^d*University of Aegean, Karlovassi, 83200 Samos, Greece*
eloukis@aegean.gr

Abstract. Open data offer tremendous potential for participation and innovation. Yet open data providers and users are puzzled about what to do and what are key issues they should concentrate on. In this workshop, we provide insight in and discuss critical success factors for open data participation and innovation from various perspectives. The workshop contains various interactive elements, including a discussion about a research agenda for open data innovation and a brainstorming session about critical success factors for open data provision and use.

Among the strongest motivators for opening government data is that it is expected to boost innovation and enhance participation in public affairs. Hence, innovation and participation are the two sides of the open data coin. While research on open data supply is growing, little is known about the emerging successes or failures of open data use. Data publication does not automatically lead to the use of data, growth in participation of stakeholders, or more innovative initiatives. There is a gap in research and practice regarding the critical success factors to foster the use of published data and to stimulate its economic and societal applications. This workshop aims to contribute to filling this gap by discussing insights in how innovation and e-participation can take place with open government data and what are the critical success factors for their realisation. This workshop contains presentations and discussions concerning the following topics.

- Models and a research agenda for user participation in public sector innovation
 - A generic model for user participation in public sector innovation is presented to and discussed with the participants (by Iryna Susha). The integrated model combines insights from a literature review on innovation,

e-participation, and Information System adoption theories. Workshop participants are stimulated to provide feedback on the model.

- Research on open data innovation and research directions (by **Anneke Zuiderwijk**). Insights from desk research on the state-of-the-art of open data innovation are presented. Based on existing research conclusions are drawn about an emerging research agenda.
- Critical succes factors
 - Participation through the provision of social media functionalities on open government platforms – A new generation of open government platforms is presented. A ‘value model’ of an advanced open government platform is also presented, which shows the usefulness of novel features (by **Euripidis Loukis**).
 - Critical success factors for open data participation by governments – A case study from the city of Vienna (by **Peter Parycek**). The talk will focus on internal and external community management in the City of Vienna based on qualitative interviews with stakeholder groups in Vienna.
 - Critical success factors for open data participation by researchers, citizens and civil servants – Findings from surveys on open data infrastructures (by **Anneke Zuiderwijk**). In this presentation insights from surveys with researchers, citizens and civil servants as open data users are presented.
 - Critical success factors for open data participation by businesses – Findings from a survey on open data innovation carried out among entrepreneurs and companies in Sweden and the Netherlands (by **Iryna Sussha**).
 - Discussion with the public about critical success factors. Participants will be asked to first individually think about and write down critical success factors for open data provision and use. Subsequently, these success factors will be discussed in a plenary discussion.
- Models for open data participation by businessess (by **Marijn Janssen**). Various business models positioned between open data providers and users have emerged. Based on twelve cases, six business models have been identified. Ideas about these models are discussed and participants are challenged to think of additional models.
- Wrap-up and conclusions (by **Marijn Janssen**).

Acknowledgement

This workshop is organized by the eGovPoliNet project, which is funded under EU FP7. The aim of this project is to build a global multidisciplinary digital governance and policy modelling research and practice community, see: www.policy-community.eu.

Workshop: eParticipation for Slum Upgrading in Mtwapa, Kenya

Claudio TORRES^{a,1}, Fabienne PERUCCA^a and Joshua MULANDI^a

^aUN-Habitat, United Nations Human Settlements Programme

Abstract. The proposed ePart2014 workshop focuses on an eParticipation tool being designed and piloted within an on-going slum upgrading programme in the coastal town of Mtwapa, Kenya. The Participatory Slum Upgrading Programme (PSUP), implemented by UN-Habitat in Kenya and in other 32 African, Caribbean and Pacific countries, has partnered for the development of this tool with FUPOL Consortium (Future Policy Modelling). In Mtwapa, half of the 60,000 population live in informal settlements and slums. PSUP-Mtwapa aims to address the five main deprivations that characterise slum dwellers' life: lack of improved sanitation, lack of access to drinking water, lack of sufficient living area, lack of durable housing and lack of security of tenure. The PSUP approach promotes community participation by bringing together slum communities and authorities to engage in participatory decision-making, planning and implementation of activities to improve the quality of life within slums, in the understanding that such a process is crucial to provide sustainability to slum upgrading. In line with this, the PSUP eParticipation tool is intended to be used as a platform to gather public inputs, judge consensus, disseminate key information, offer two-way discussions between residents and authorities, and to develop and monitor slum upgrading projects. The programme's implementation is envisaged for 2014 – 2015. The ePart2014 workshop is a timely opportunity to get an expert review of this tool.

Keywords. eParticipation, slum upgrading, urban poverty, PSUP, FUPOL, Kenya

Introduction

PSUP-Mtwapa is a slum upgrading programme that, in regard to its participatory approach to planning and implementation of slum upgrading activities, has incorporated eParticipation in order to support meaningful community engagement in PSUP actions. Key partners in the programme are the Ministry of Land, Housing and Urban Development of Kenya and the Kilifi County Council, representing central and local governments, respectively. Mtwapa Town is located in Kilifi County, in the vicinity of Mombasa City. Half of the town's population lives in informal settlements. PSUP-Mtwapa's overall objective is to improve the standard of life of Mtwapa' slum dwellers by regularizing all informal settlements and improving infrastructure services.

Aiming to achieve this objective in an environ of increased participation, governance, transparency and accountability, the programme has identified the use of eParticipation tools (blogs, social media) by concerned stakeholders as an effective way of consolidating a platform to exchange ideas, get informed, monitor activities and,

¹ Corresponding Author: Claudio Torres Roje, UN-Habitat, P.O. Box 30030, GPO Nairobi 00100, Kenya; E-mail: claudio.torres@unhabitat.org.

most significantly, make decisions. A strategy to avoid exclusion from eParticipation have also been devised by combining new technologies with traditional ways of community interaction, communication and organisation.

This innovative application of eParticipation for sustainable slum upgrading is a way to enhance citizen engagement and to provide key information and guidance to authorities. Hence, the discussion of the Mtwapa pilot project is expected to be relevant both to ePart2014 – particularly referring to the use of social media and policy modelling instruments – and to the understanding of the little explored area of eParticipation in developing countries.

1. Workshop Objective

The main objective of the workshop is to discuss and envision how eParticipation can effectively support slum upgrading and strengthen the capacity of concerned communities and authorities in addressing the challenges posed by informal settlements in a coordinated way.

Expecting significant contributions from an audience made out of experts and researchers, the workshop will provide valuable inputs on how eParticipation can contribute to improve urban governance, especially in the context of urban poverty.

2. Expected Outcomes of the Workshop

- Collect opinions and views on the PSUP eParticipation's approach and tools
- Raise awareness and understanding on eParticipation in developing countries
- Gather recommendations on eGovernance and eParticipation methodologies
- Develop knowledge on ICT in the context of slums and informal economy

3. Workshop Structure and Audience Participation

The workshop will combine thematic presentations with open debate. Presentations will include (i) background information about PSUP and PSUP-Mtwapa, (ii) a general overview of slums' living conditions, set-up and incidence, (iii) Mtwapa and Kenya's current social and political settings, (iv) FUPOL network and strategy, and (v) PSUP eParticipation's methodology, tools and first findings.

Interested researchers, policy-makers and urban practitioners attending ePart2014 are the target audience. Participants from developing countries are particularly expected as they can share their own experiences and findings on the use of eParticipation in the developing world.

The open debate will be structured around the following questions:

- How can the slum upgrading process be supported by eParticipation?
- How can eParticipation avoid social exclusion in a poor urban context?
- How can eParticipation build trust among vulnerable citizens?
- How can eParticipation build trust among authorities unacquainted with it?
- How can eParticipation improve urban governance in developing countries?

Subject Index

administrative literacy	216	electronic services	216
administrative procedures	197	electronic voting	55
application development	3	empty signifier	66
argumentation technology	175	ensemble view	254
assessment	76	enterprise architecture	227
barrier-reduced machines	299	eParticipation	307
building blocks	163	Estonia	55
business interoperability interface	141	evaluation	20, 30, 267
changing roles	197	expert systems	267
citizen-led e-participation	40	FUPOL	307
CNC	299	fuzzy cognitive maps	175
collaborative research	153	good governance	185
communicability	244	ICT	299
comparative analysis	153	ICT impact	130
conceptualizations of ICTs		individual differences	120
artefact	130	information artefacts	287
correlation analysis	76	information model	106
data model	106	information systems	287
deliberation platforms	175	information-oriented metrics	244
demands driven development	66	integration processes	299
design thinking	163	integrative approaches	254
developing countries	267	integrative design	299
development	84	internet voting	55
digital divide	216	interoperability	106, 227
digital government	254	interoperability architecture	141
digital literacy	216	Kenya	307
digitization	197	learning systems	287
discourse analysis	66	linked business process models	237
document discussion	13	local government	267
e-cognocracy	20, 30	Maturity model	95
e-Government	120, 185, 237	mentally disabled people	299
e-Government impact	197	mobile participation	3
e-participation	20, 30, 40, 76, 175	Moodle course room evaluation	287
e-participation framework	40	multi-disciplinary research	153
e-petitions portal	76	new public management (NPM)	276
e-procurement	141	open data	95
e-service layers	244	open government data	95
eConsultation	13	open public data	175
effectiveness	20, 30	organizational changes	299
efficiency	20, 30	participation	13
efficacy	20, 30	participation practices	3
electronic government	216, 254	participation support	3
electronic participation	3	participatory subject	66

policy	163	service sustainability	206
policy analysis	175	services introduction	276
policy making	175	slum upgrading	307
policy modelling	153	smart democratic businesses	299
policy monitoring	175	social determinism	254
process auto completion	237	social media public sector	276
process translation	237	social networks	76
prosperity indexes	175	software development	
PSUP	307	methodology	141
public administration	106	stakeholder theory	84
public e-service(s)	66, 84	technical improvements	299
public private financing	185	technological determinism	254
public private partnership	185	test process	244
public procurement	227	time	197
public value	276	tolling systems	185
rationality of voting	55	trust	120
remote electronic voting	55	urban poverty	307
road taxation	185	user experience	287
road user charges	185	user involvement	84
roadmaps	95	V-model	141
rural development	130	value network	206
Saudi Arabia	120	voting process	55
semantic business process		welfare	206
modeling	237	wicked problems	163

Author Index

Albeshier, A.	120	Majstorovic, D.	153
Bannister, F.	xi	Marasso, L.	206
Bershadskaya, L.	76	Markaki, O.	175
Breslin, J.	40	Mondorf, A.	141
Brooks, L.	120	Moreno-Jimenez, J.M.	20
Cestnik, B.	216	Mulandi, J.	307
Chetta, V.	206	Ojo, A.	40
Christiansson, M.-T.	244	Osmani, M.W.	276
Chugunov, A.	76	Päivärinta, T.	106
Cretton, F.	237	Parycek, P.	307
Daniels, F.	95	Pekkola, S.	227
De Cindio, F.	30	Perez Espes, C.	20
El-Haddadeh, R.	276	Perlangeli, C.	206
Ertiö, T.-P.	3	Perucca, F.	307
Evequoz, F.	197	Porwol, L.	40
Fortunato, L.	206	Psarras, J.	175
Giangreco, E.	206	Ruoppila, S.	3
Gidlund, K.L.	66	Ryhänen, K.	106
Gil-Garcia, J.R.	254	Scholl, H.J.	xi
Glassey, O.	xi, 197	Scholl, M.	287, 299
Glickman, Y.	175	Sefyrin, J.	66
Hawryszkiewicz, I.T.	163	Sivarajah, U.	276
Hossain, M.S.	267	Sokhn, M.	237
Jansen, A.	130	Solar, M.	95
Janssen, M.	xi, 307	Stortone, S.	30
Kern, A.	216	Susha, I.	307
Kitsing, M.	55	Svarre, T.	267
Kokkinakos, P.	175	Tambouris, E.	xi
Kourakou, G.	197	Taudes, A.	13
Koussouris, S.	175	Torres, C.	307
Le Calve, A.	237	Trutnev, D.	76
Lee, H.	175	Tyrväinen, P.	106
Lemmetti, J.	227	van Engers, T.	185
Leo, H.	13	van Haaften, W.	185
Lindgren, I.	86	Vivanco, L.F.	254
Lopez, R.	95	Weerakkody, V.	276
Loukis, E.	307	Wik, M.	244
Luna-Reyes, L.F.	254	Wimmer, M.A.	xi, 20, 141, 153
Maalouf, E.	237	Zander, P.-O.	267
Macintosh, A.	xi	Zuiderwijk, A.	307

This page intentionally left blank