Editorial for EJEG Volume 15 Issue 2

It is with great pleasure that I write this editorial, which is my first after succeeding Frank Bannister as editor-in-chief. It is a huge challenge to follow in Frank’s footsteps. I would like to thank Frank for his long and distinguished service to the journal. His outstanding work in raising the academic quality of EJEG is obvious to the readership of the journal. What is less obvious is his diligent work in giving constructive and encouraging feedback to authors submitting their papers. His role was simultaneously a gatekeeper and a mentor I am sure we will benefit from Frank’s association also in the future.

However changing editors also opens up opportunities for making changes. We have created an Advisory board consisting of four members. Frank has agreed to be a member which ensures continuity and the continuity is strengthened by another member Dan Remenyi who has been the driving force behind EJEG for over a decade. Joining them on the board are Sharon Dawes, professor emerita from University of Albany and Maung Sein, professor at University of Agder, two distinguished scholars of long standing in the eGovernment area.

We have also made some changes in the editorial ranks. EJEG now has a number of new Associate Editors. Each member has specific responsibilities. Mary Griffiths from University of Adelaide, Australia, will continue to be an AE with responsibility for empirical work. We welcome Alea Fairchild from Odisee Business School in Belgium who will special responsibility for case studies and for practical contributions. Salah Kabanda from University of Cape Town, South Africa will have special responsibility for book reviews and for e-Government in developing countries. Last but not the least, we welcome Alain Ducass, an independent researcher and former French civil servant who will have special responsibility for book reviews and public policy related matters. We have also gone through the list of reviewers, deleted the ones who have not delivered and got commitment from a limited number of fellow researchers. I have been really impressed by some of the reviews I have seen and look forward to receiving more high-quality reviews in the future. This is helpful both for the journal as well as for all the researchers submitting their work.

I look forward to working with this great team, and hope to develop the journal further and increase its quality and standing. I hope to be able to attract both solid academic work that contribute in theory-building and fresh innovative papers that have practical impact. My ambition is to have 4 issues per year of the journal, some of them being special editions. To accommodate that we need to be efficient in our review cycle.

In this issue, Alain Ducass has contributed as associate editor with an introductory article on e-Government in Africa. As a journal, we have seen a few papers from different countries in Africa, and this overview article should prove useful. This issue further sees 3 papers on adoption of e-Government in quite different contexts, in Philippines, Kuwait and Belgium, and with quite different focus.

Urbino and Abe takes a citizen-centric perspective on adoption in Philippines. Even though Philippines has a lower percentage households with access to computers and to Internet than developing countries in general, the country has a higher proportion of individuals using Internet. Urbina and Abes concern is that the individuals who may need governmental services most may be the ones with least possibilities for access. Through a large face-to-face survey, they find that lack of access and socio-demographic factors affects awareness and adoption.

Elenezi, Tahini, Masa’deh, Alalwan and Al-Qirim focus on the relation between different dimensions of information quality and e-Government adoption and benefits in Kuwait. The dimensions they found really mattered were: accuracy and completeness, objectivity, interpretability and relevancy, and security and timeliness, and accessibility.

In the third article on adoption, Alomar and Visscher focus on e-procurement by private firms in Belgium. They have done an impressive survey based on well-known adoption models such as TAM, DOI and TOE (Technology, Organization, Environment framework) and develop a synthesized model that explains a lot of the variance in adoption.
Joshi and Wehn examines the belief that new tools for e-participation can generate dramatic transformations. They do this based on a conceptualization of what e-participation means within the context of multi-level governance. In two European case studies they found a marked shift from the tokenistic forms of e-participation to more hands-on. However, irrespective of the possibilities new tools offer for co-creation of policies, the paradigm was still mainly “design – defend – implement”.

Finally, in a systematic literature review on Enterprise Architecture in Public Sector, Dang and Pekkola find that the overwhelmingly part of publications are from Europe and Asia, where more than half focus on development. What is surprising is that popular, established frameworks such as TOGAF does not seem to be used by governments. Dang and Pekkola call for more research on implementation and challenges such as governance structures, EA management, interoperability and integration, from different contexts and settings.

Carl Erik Moe
March 2017
E-Gov Development in Africa

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Some International Organizations are publishing international benchmarking reports which include valuable information about the information society.

The International Telecommunication Union publishes every year their “Measuring the Information Society Report” (ITU, 2015). The Information Development Index which ITU publishes is based on three sub-indicators: access indicators, use indicators and skill indicators, but it does not include any e-Gov indicators.

The World Economic Forum publishes the Networked Readiness Index (WEF, 2015), as shown in figure 1. This includes an 8th pillar dedicated to the Governmental uses of Information technologies.

![Networked Readiness Index (WEF, 2015)](image)

Figure 1: Networked Readiness Index (WEF, 2015)

This subindex deals with the manner in which the Government is using IT to practice employees’ jobs, but it is not yet an e-Gov index.

The only specific index dedicated to e-Gov is the “e-Government Development Index” published by the United Nations (UN, 2016):

The E-Government Development Index presents the state of E-Government Development of the United Nations Member States. Along with an assessment of the website development patterns in a country, the E-Government Development index incorporates the access characteristics, such as the infrastructure and educational levels, to reflect how a country is using information technologies to
promote access and inclusion of its people. The EGDI is a composite measure of three important dimensions of e-government, namely: provision of online services, telecommunication connectivity and human capacity.

According to this index, as can be seen in figure 2, Europe seems to be the leader and Africa the last region in the world.

**Figure 2: 2016 E-Government Development Index**

Within Africa, as can be seen in figure 3, all regions are not equal:

**Figure 3: 2016 E-Government Development Index within Africa**

According to the chart, western Africa and middle Africa are the last regions in the world for e-Government. The question now is whether or not they are going to leap-frog development in that field.

To answer this question let us first of all set out some basic information:

- The African countries used to have an administration with very few services provided to the citizens and companies. Now they all are moving towards e-Gov. While developing e-Government, African countries are developing it together with administrative services.
- E-Gov is only one of the three pillars of a digital strategy, including connectivity (to bring broadband to anyone, anywhere, whatever the receiving device), business (to develop national IT skills and
companies as well as B2B, B2C and C2C e-transactions), and e-Gov (to develop e-services between the Government and the civil society, and within the Government itself).

- A prerequisite for a country to develop e-Gov is that the administrative services and the citizens could be connected to the web with fixed or mobile devices. Generally, this condition is reached in the main towns of the countries but not in the villages, so that e-Gov is still a late arrival in African countries.

- A main goal of e-strategies is sovereignty, meaning that a country should be able to keep a part of the IT turnover and data inside the country. This goal means that the country has developed and is acting to develop national IT companies. This is definitely a key factor: to customize, maintain and adapt e-Gov applications as well as other IT applications.

- It is very difficult to compare the e-Gov programs of two different countries because each e-service can have a very different level of interactivity, so that two e-services with the same name, such as a Governmental portal, can mean very different realities and incur very different costs.

- Culture and corruption are not at all the same in Europe and in Africa. One factor to take into account in Africa is the very low salary that civil servants receive for their jobs. This is the reason why many African civil servants must have a second job to feed their families, or a second revenue stream from the people they help with their administrative activity. Hence it is necessary to investigate the social impact of e-Gov before implementing it.

- E-Gov is not a project like building a house, but features a program that includes some key projects and a large number of smaller ones.

To go further, figure 4 shows a global chart of an e-Gov Strategy and action plan.

![Figure 4: e-Gov strategy and action plan](image)

It includes, first of all, a strong management layer, in charge of the goals, the legal frames, the semantic standards, the action plans and also of the ministerial projects coordination.

It also includes some major blocs of e-Gov such as an intranet network to connect the public bodies, a data centre to host the e-services, and also of an interoperability and e-Gov services platform, allowing the individual ministries easily to develop e-Services.

Then an e-Gov action plan includes one or many portals for the various public services (e-education, e-health, e-agriculture, e-taxes, e-social ...). Some of them are top-down designed, allowing the ministries to publish information to the citizens, or companies. Some other ones are said to be "open data", allowing the public sector to re-use the public information, which is shared with the private sector. Some of them are collaborative, with information provided by the users and the administration together to build up e-Services.
Many other topics about e-Gov could be told, but for now, let us stop on one last one; that is the need for collaborative tools between the civil servants and other persons in charge of e-Gov, to reduce the cost and enhance efficiency.

Some words have to be given about the cost-effectiveness of e-Governement. The World bank and some other donors are sometimes ready to invest 50 to 100 million dollars to help a country developing e-Gov, but they have in mind finance, real estate and “brick and mortar” projects rather more than e-projects. This is not completely false logic, because there is a risk of financing useless projects if they are not well coordinated within a national strategy and real action plan.

One key success factor is indeed the good circulation of information between the many persons in charge of e-Gov in a country and in a region.

This point will give an occasion for a further article, together with the main publications related to real e-Gov in Africa.

References


Citizen-centric Perspective on the Adoption of E-Government in the Philippines

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Abstract: Information and communications technologies (ICTs) and the Internet are widely used as strategic means to improve the efficiency and effectiveness of governments and the accessibility of government information and services to citizens. In the Philippines, the government has prepared elaborate plans to enhance implementation of e-government in the country. Thus, it is only fitting to investigate the state of the adoption of e-government in the country not only to monitor progress of its implementation but to further improve access of citizens to government information and services. However, due to the inherent disparities in socio-demography, access to ICTs, Internet use as well as in the patterns of Internet use, and awareness of available e-government services in developing countries such as the Philippines, the adoption of e-government by citizens in the country is faced with major challenges (e.g., inequitable access to information and government services, widening of the gap between advantaged and disadvantaged groups). In order to uncover the state of adoption and citizens' perception of e-government in the Philippines, this study analyzed primary data collected through a national-scale survey conducted as a result of collaboration with a private social research institution based in the Philippines. Descriptive and inferential statistics were employed to describe the state of adoption of e-government in the Philippines and examine the effects of socio-demographic factors; access to ICTs and the Internet; and attitudes toward e-government on the awareness and adoption of e-government in the country. The study further validates the findings of other empirical studies on e-government adoption found in literature.

Keywords: online public services, digital divide, logistic regression analysis

1. Introduction

Information and communication technologies (ICTs) and the Internet have transformed traditional means of communication and interaction among citizens in many countries. They have also been widely used in the private/business sector and the success of its utilization is extensively evidenced at a worldwide scale. This has caused governments and public sector organizations around the globe to become aware of their potential and consequently utilize them; thereby triggering investments into electronic services (Choudrie, et al., 2004).

In general, the employment of ICTs and the Internet in the administration of government functions and in the delivery of public services is described as electronic government or e-government. E-government helps governments to achieve greater operational and cost efficiencies in performing their administrative functions and improve public service delivery by providing efficient, convenient and less costly means in accessing government information and services. The Organisation for Economic Cooperation and Development (OECD) defines e-government as the use of ICTs, and particularly the Internet, as a tool to achieve better government (OECD, 2003). The implementation and adoption of e-government are extensively discussed in the literature produced by the OECD to monitor developments of its member countries, which are mostly developed economies, on the subject matter. It has become imperative for most members of the OECD to adopt e-government to sustain their competitiveness with regard to advancing their society and economy. On the other hand, there is only little literature on the state of e-government adoption in developing countries. Moreover, critics claim that the development of electronic public services has been primarily guided by supply side factors (e.g., availability and level of sophistication of online government services) and that technological possibilities rather than user needs have determined the design of online public services (Bertot & Jaeger, 2006); (Kunstelj, et al., 2007); (Reddick, 2005); (Schedler & Summermatter, 2007); (Ebbers, et al., 2008).

Studies on the adoption of e-government in literature can be categorized into two groups, namely, the supply-side and the demand-side (Reddick, 2005). The first group of studies is concerned on the adoption of e-government from the supply-side perspective, which deliberates factors (e.g., information technology infrastructure, financial resources for IT development, number of e-government initiatives implemented) that...
are essential to the government as the supplier of public services (Reddick, 2005). On the other hand, the second group of studies mainly focuses on the demand-side perspective of e-government adoption, which explores factors that are important to the clients of the government or consumers of public services (Reddick, 2005). This study is associated with the latter group, which is the demand-side of e-government adoption, particularly the use of online government portals in accessing government information and services by citizens in the Philippines.

1.1 Background

The following subsections provide a brief background on the probable implications of the digital divide in the adoption of e-government and the local conditions and trends in the Philippines with respect to the use of ICTs and the Internet.

1.1.1 The Digital Divide

As provided in the above definition of e-Government, the Internet is the key medium or channel through which government information and services are being delivered to citizens electronically. Without access to the Internet, the potential benefits that can be derived from the adoption of e-government simply cannot be realized by both the government and citizens.

Wilson (2006) broadly defines the digital divide as the inequality in access, distribution, and use of information and communication technologies between two or more populations (Wilson, 2006). On the other hand, Fuchs (2008) reflects that technologies enable and constrain human practices that their main dimensions are the material access to them (in modern society mainly with the help of wealth as technologies are sold as commodities), the capability to use them, the capability to use them in such ways that oneself and others can benefit, and embedding institutions (Fuchs, 2008). Hence, Fuchs (2008) refers to digital divide as the unequal patterns of material access to, usage capabilities of, and benefits from computer-based information and communication technologies that are caused by certain stratification processes [i.e., social hierarchies such as age, family status, ability, gender, ethnicity, origin, language, and geography (urban/rural)] that produce classes of winners and losers in the information society, and of participation in institutions governing ICTs and society (Fuchs, 2008).

The United Nations (UN) initially considers the digital divide as primarily an issue of access to relevant information technology infrastructure compounded by the prohibitive cost of access, especially in the developing countries. As technology has proliferated, the physical and financial access barriers have given way to challenges which stem more from capacity and capability (i.e., ability and competence to use ICTs) of individuals (UNDESA, 2014).

1.1.2 Trends in ICT and Internet Use in the Philippines

The Philippines is a developing country in Southeast Asia. Based on the 2010 Philippine Census, the country has a population of more than 92 million with an average annual growth rate of 1.9% from 2000 to 2010 (Source: 2010 Census of Population and Housing, Philippine Statistics Authority). In 2013, the population in the country was estimated at about 96 million. According to the International Telecommunications Union (ITU), 37% or about 35.5 million of the country’s population are using the Internet (Figure 1.1). This Internet penetration rate is almost the same as the world average and slightly higher than the average rate in developing countries.

![Figure 1.1: Individuals using the Internet in the Philippines from 2003 to 2013 (ITU, 2014)](image-url)
However, Figures 1.2 and 1.3 show the consistent trend of lower levels of household ownership of computers and Internet access in the Philippines compared to the world average and the average rate in developing countries. It is remarkable that individual usage rates of the Internet in the country may seem to be not affected by the low levels of household ownership of computers and Internet access. According to the Asian Institute of Journalism and Communication (2009), there are more individuals accessing the Internet from cybercafés or Internet shops than from their homes or workplace in the Philippines (AIJC, 2009). To some extent, the proliferation of Internet shops in the Philippines bridges the digital divide by providing affordable access to computers and the Internet. Also, the popularity and appeal of social networking sites enable citizens to access the Internet.

**Figure 1.2:** Percentage of Households with Computer in the Philippines from 2005 to 2012 (ITU, 2014)

**Figure 1.3:** Percentage of Households with Internet Access in the Philippines from 2005 to 2012 (ITU, 2014)

In view of the above trends in ICT and Internet use, the adoption of e-government is a major policy challenge for the international community, especially for developing countries such as the Philippines. With the low rates of Internet penetration in the country, the trend of e-government adoption in the country may be lethargic, if not, defiant. Since it is by the widespread use of the Internet that developments in the adoption of e-government may be sustained, the digital divide is deemed a major barrier in realizing the potential benefits of e-government.

The Philippine government has prepared elaborate plans [e.g., Government Information Systems Plan (GISP), Philippine Digital Strategy (PDS), E-Government Master Plan] to enhance implementation of e-government in the country. As of 2012, web presence of national government agencies in the Philippines reached 93.87% (i.e., 306 out of 326 government agencies have their own websites as of December 2012 according to the Philippine National Computer Center). However, there has been no study to investigate the adoption of e-government by citizens in the Philippines to date.

### 1.2 Objectives of the Study

There is a threat of digital exclusion, which refers to the marginalization of individuals who do not have access to and cannot effectively use ICTs and the Internet, with the implementation of e-government, which can exacerbate already-wide gaps between advantaged and disadvantaged groups. Yet, interests of policymakers...
in e-government have been directed toward the supply-side of electronic public service delivery and consequently, there are much fewer, if not lack of, data and investigations on the demand side (or from the perspective of citizens). Hence, this study intends to respond to the proposition for more demand-side oriented assessments of e-government and examine the several aspects of e-government adoption from the perspective of citizens of the Philippines. Specifically, the objectives of the study are to:

a) determine the state of e-government adoption by citizens in the Philippines; and
b) examine the effects of socio-demographic factors; access to ICTs and the Internet; and attitudes toward e-government on the awareness and adoption of e-government in the Philippines. Particularly, the key areas of interest in this study are the following:

<table>
<thead>
<tr>
<th>Key Factors of Interest</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-demographic factors</td>
<td>The set of elements or aspects characterizing a population (i.e., age, gender, educational attainment, type of settlement (i.e., urban or rural), geographic location, socioeconomic class (i.e., proxy indicator for income level that is based on the ratio of average incomes of the different social classes established by SWS), and employment status].</td>
</tr>
</tbody>
</table>
| Access to ICTs and the Internet | Categorized as the following:  
  • Household ownership of computers  
  • Internet use  
  • Frequency of Internet use (i.e., how often individuals use the Internet)  
  • Breadth of Internet use (i.e., range of online activities or Internet applications proficiently used by individuals) |
| Attitudes toward e-government | Categorized as follows:  
  • Trust in e-government (i.e., explained by willingness to provide personal information on government websites)  
  • Perceived usefulness of online government portals. |

2. Literature Review

There are several theoretical frameworks that explain how and why individuals adopt new technologies, among others, Theory of Reasoned Action (TRA) (Fishbein & Icek, 1975); Technology Acceptance Model (TAM) (Davis, 1989); Theory of Planned Behaviour (TPB) (Ajzen, 1991); Diffusion of Innovations (DOI) Theory (Rogers, 1962); and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, et al., 2003). Based on said theoretical frameworks, there were several empirical studies undertaken in different countries to analyze e-government adoption. Table 2.1 shows a list of related studies on e-government adoption conducted in several countries. In detail, it summarizes several determinants of e-government adoption, validated in said studies, using different conceptual models/theories on ICT acceptance.

Table 2.1: Related Studies on E-Government Adoption

<table>
<thead>
<tr>
<th>Proposed Determinants of E-Government Adoption</th>
<th>Conceptual Models Used</th>
<th>Country</th>
<th>Supported Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposition to trust, trust of Internet, trust of the government, and perceived risk</td>
<td>TRA</td>
<td>USA</td>
<td>(Belanger &amp; Carter, 2008)</td>
</tr>
<tr>
<td>Perceived ease of use, compatibility and trustworthiness</td>
<td>TAM and DOI</td>
<td>USA</td>
<td>(Carter &amp; Belanger, 2005)</td>
</tr>
<tr>
<td>Perceived usefulness and compatibility</td>
<td>TAM and TPB</td>
<td>Singapore</td>
<td>(Fu, et al., 2006)</td>
</tr>
<tr>
<td>Perceived usefulness, personal experiences, risk perception, and trust</td>
<td>TPB</td>
<td>Netherlands</td>
<td>(Horst, et al., 2007)</td>
</tr>
<tr>
<td>Perceived usefulness, ease of use, perceived risk, trust, compatibility, external influences, impersonal influence, self-efficacy, and facilitating conditions</td>
<td>TPB</td>
<td>Taiwan</td>
<td>(Hung, et al., 2006)</td>
</tr>
</tbody>
</table>
Proposed Determinants of E-Government Adoption

<table>
<thead>
<tr>
<th>Conceptual Models Used</th>
<th>Country</th>
<th>Supported Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information quality (perceived usefulness), system quality (perceived ease of use), and social influence</td>
<td>TAM</td>
<td>Macao</td>
</tr>
<tr>
<td>Trust, perceived behavioral control, and attitudes</td>
<td>TPB</td>
<td>Turkey</td>
</tr>
<tr>
<td>Socio-demographic factors, perceived usefulness</td>
<td>n/a</td>
<td>Canada</td>
</tr>
<tr>
<td>Availability of e-government services, awareness of e-government, preference to digital channels, ability and experience to use digital channels</td>
<td>UTAUT</td>
<td>Netherlands</td>
</tr>
<tr>
<td>Perceived usefulness, perceived ease of use, computer self-efficacy</td>
<td>TAM</td>
<td>Thailand</td>
</tr>
</tbody>
</table>

In other related studies, the significance of socio-demographic factors in influencing the use of online government channels were emphasized (Van Dijk, et al., 2008); (Dimitrova & Chen, 2006); (Reddick & Turner, 2012). Thus, to support the implementation of e-government, the process of identifying and managing a broad range of constituent stakeholders (i.e., various government bodies as well as citizens) must be considered not only to ensure successful implementation (Chan, et al., 2003); (Pardo & Scholl, 2002) but more specifically to improve access to government information and services.

As with the introduction of new public policies, in general, the implementation of e-government will bring about challenges to both the government and citizens. The lack of access to e-services (Chircu & Lee, 2005); (Huang, 2007); (Carter & Weerakkody, 2008), trust (Carter & Weerakkody, 2008); (Welch, et al., 2005); (Al-Sebie & Irani, 2005), individual differences (Patel & Jacobson, 2008) and the digital divide (Carter & Belanger, 2005); (Chen, et al., 2006) are few of the challenges that can impact on inclusiveness of the use of online government channels.

Online access has advantages that are impossible to replicate offline, such as the drawing together of information, independent search capacity and interactive policy consultation (OECD, 2003). However, there are significant disparities in access to ICTs and the Internet. Generally, the most disadvantaged have the lowest levels of access, yet they also often have high levels of interaction with government and if these individuals cannot access e-government services, they will miss out on many of its benefits (OECD, 2003).

The consensus in e-government adoption literature is that those with higher education and higher income are more likely to use e-government information and services (Dimitrova & Chen, 2006). In Turkey, a study was undertaken to explore the possibility of gender difference in adoption of e-government services, and found that gender differences were huge in terms of "perceived acceptance of Internet and e-government" (Akman, et al., 2005). However, according to Akman et al. (2005) these findings are in contrast to the study undertaken in the United States of America that suggested "disparity in Internet usage between men and women has largely disappeared" (Akman, et al., 2005). One possible reason for this difference could be due to cultural tendencies that lead to the adoption of different online communication styles by men and women as inferred in the study of (Cakir & Cagiltay, 2005).

In contrast to research studies supporting conceptual theories of ICT acceptance, which focus on individual characteristics of adopters (i.e., based on socioeconomic characteristics, personality traits, and communication behavior, etc.), Pilling and Boeltzig (2007) suggest that more focus should be place on systematic barriers to the Internet and e-government, such as; unequal Internet access; unequal access to e-government; problems with website accessibility and usability; that prevent people from accessing and eventually adopting technology such as the Internet and e-government (Pilling & Boeltzig, 2007).

3. Significance of the Study

According to the United Nations (2012), there is no comprehensive data available to assess citizen usages at the global level (UNDESA, 2012). Furthermore, there has not been any study or data on the adoption of e-government by citizens in the Philippines to date. Thus, this study intends to fill-in information gaps in the state of e-government adoption in the Philippines and responds to the advocacy for data initiatives and information sharing regarding e-government adoption for international benchmarking. This study also aims to pave the way for more empirical studies, and starting point for longitudinal studies, in the context of the
adoption of the Internet and e-government by citizens in the Philippines drawing insights from relevant studies presented in the literature review as basis to generate well-grounded results.

Research consistently identifies socio-demographic factors as significant predictors of access to technology (Belanger & Carter, 2009); (Hoffman, Novak, & Schlosser, 2000); (Mossberger, Tolbert, & Stansbury, 2003); (Thomas & Streib, 2003). The adoption of e-government is limited to those who have access to the technology and possess the skills necessary to utilize e-services; and as governments worldwide increasingly implement e-government services, concerns about the potential impacts of the digital divide continue to grow (Belanger & Carter, 2009). Few of the opportunities brought about by the use of ICTs and the Internet are from the benefits derived from e-government. The divide in the access to ICTs and the Internet draws exclusivity in the access to opportunities resulting from the use of such technologies, thus, making the disadvantaged seem worse off. The inequality in access to e-government is a challenge to policymakers with respect to their role of making government services equally accessible and beneficial for all.

In view of the above, it may be worthwhile to investigate the significance of socio-demographic factors, physical access to technologies and attitudes towards technologies in explaining e-government adoption in the Philippines.

4. Methodology

This study employed primary data obtained from the First Quarter 2014 Social Weather Survey, which is a national-scale survey conducted by the Social Weather Stations or SWS from March 27 to 30, 2014 in the Philippines. SWS is a private non-stock, nonprofit social research institution that is responsible for the conduct of the quarterly Social Weather Surveys, which aim to provide an independent source of pertinent, accurate, timely and credible data on Philippine economic and social conditions. The surveys include both regular time series, or items to be monitored from survey to survey, and contemporary readings, or items to be modified from time to time. The time series include many variables which SWS has been monitoring for several years, thus, providing trends in economic and social conditions. Prior to the conduct of the survey for the study, consultations between the authors and SWS transpired for the inclusion of the set of questionnaire on e-government adoption by citizens in addition to questions already included in the syndicated surveys of SWS. The inclusion of the questionnaire on e-government adoption makes the First Quarter 2014 Social Weather Survey unique among other surveys conducted by SWS.

4.1 Survey Design

The design adopted by SWS for the survey was intended to generate responses from national representative respondents. The survey data were obtained through face-face interviews of voting age adults (i.e., 18 years and above)

4.1.1 Sampling Scheme

The First Quarter 2014 Social Weather Survey was conducted in four (4) major areas in the Philippines with locations spread out throughout the country. The 4 major areas were the following: National Capital Region (NCR); Balance Luzon (i.e., Luzon excluding NCR); Visayas; and Mindanao. A number of 300 respondents were allocated for each of the 4 survey areas, which sums to a total of 1,200 respondents for the entire country. Table 4.1 shows the national-scale distribution of respondents based on the multi-stage sampling conducted by SWS.
Table 4.1: Multi-stage Sampling for Selection of Respondents

<table>
<thead>
<tr>
<th>Area</th>
<th>Sample Province</th>
<th>Sample Municipality</th>
<th>Sample Barangays (or Villages)</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCR</td>
<td>0</td>
<td>17</td>
<td>60</td>
<td>300</td>
</tr>
<tr>
<td>Balance Luzon</td>
<td>10</td>
<td>15</td>
<td>60</td>
<td>300</td>
</tr>
<tr>
<td>Visayas</td>
<td>5</td>
<td>15</td>
<td>60</td>
<td>300</td>
</tr>
<tr>
<td>Mindanao</td>
<td>6</td>
<td>15</td>
<td>60</td>
<td>300</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>62</td>
<td>240</td>
<td>1,200</td>
</tr>
</tbody>
</table>

Source: SWS First Quarter 2014 Social Weather Survey

For each sampled barangay, five (5) households were selected by systematic sampling. Designated starting points for selection of households vary from one of the following locations: (1) a municipal or barangay hall, (2) a school, (3) barangay captain’s house, (4) church, chapel or mosque, (5) health facility, or (6) a basketball court. Each numbered starting location (1 to 6) are randomly selected and the selected number also corresponds to the number of house/s counted from the starting location (i.e., if a particular barangay was randomly designated a starting location of 4, then the first sample household should be the 4th household from the starting point). Subsequent sample households were selected using a fixed interval of 5 households in between sampled ones.

For each household selected, a respondent was randomly selected among household members who are at least 18 years of age.

4.1.2 Survey Questionnaire

The survey questionnaire was translated into eight (8) local languages. The survey questionnaire was divided into two categories, i.e., Types I and II. Type I questionnaire includes survey questions designed to furnish data/information on socio-demography and access to ICTs and the Internet. This set of questions was adopted from the syndicated Social Weather Surveys conducted quarterly by SWS. On the other hand, Type II questionnaire includes survey questions designed to provide data on the adoption and perception of e-government. This set of questions was derived from the consultation between the authors and SWS. Types I and II survey questions were jointly administered by SWS during its First Quarter 2014 Social Weather Survey. Table 4.2 summarizes the topics covered in the survey questionnaire.

Table 4.2: Summary of Key Survey Questionnaire Topics of Interest

<table>
<thead>
<tr>
<th>Key Topics</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-demographic Information</td>
<td>Age, Gender, Educational Attainment, Employment Status, Socioeconomic Class, Geographical Location, Type of Settlement (i.e., Urban or Rural)</td>
</tr>
<tr>
<td>Ownership of Computer and Internet Usage</td>
<td>Household Ownership of Computer, Use or Non-use of the Internet, Frequency of Internet Use, Types and Number of Internet Activities Undertaken</td>
</tr>
<tr>
<td>Adoption of E-Government</td>
<td>Awareness of Government Websites, Use or Non-use of Government Websites</td>
</tr>
<tr>
<td>Perception of E-Government</td>
<td>Willingness to Provide Personal Information on Government Websites, Usefulness of Government Websites</td>
</tr>
</tbody>
</table>

Source: Authors

4.2 Statistical Analysis

The survey data were analyzed using descriptive and inferential statistics. Descriptive statistics was used to describe the population and inferential statistics was applied to draw conclusions about the study population based upon the sample data, particularly logistic regression was used as this method suitably deals with dichotomous outcome variables, in which there are only two possible outcomes. Both descriptive and inferential statistical methods were employed to ascertain and evaluate the effects of the hypothesized/potential explanatory (independent) variables and response/outcome (dependent) variables as well as determine the extent of the association between said variables (Table 4.3).
Logistic regression allows examination of how each independent variable affects the probability of a choice by a decision-maker, possible event or outcome occurring. In logistic regression, the probability of an event occurring is given by the preceding equations. These equations describe the calculation for the probability of usage or non-usage of online government portals:

\[
P(y=J|x) = \frac{\text{P}(y=J|x)}{1+\text{P}(y=J|x)} = \text{logit}(\text{P}(y=J|x))
\]

where \(y\) is the dependent variable; \(J\) is the discrete choice of a respondent (e.g., 1=Yes; 0=No); \(x\) is the matrix of explanatory variables; \(\beta\) is the column vector for the obtained coefficients by the regression, which represents the change in the natural logarithm of \(\text{P}(y=J|x)\) for each unit change in \(x\); and \(\Lambda\) is the cumulative probability density function (c.d.f.), where the probability density function (p.d.f.) is a logistic function.

To obtain the corresponding logit function, the above equation (2) is transformed into equations (3), (4) and (5):

\[
\logit\left[P(y=J|x)\right] = \log\left[\frac{\exp(\beta x)}{1+\exp(\beta x)}\right] = \logit\left[P(y=J|x)\right] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k
\]

The odds ratio (OR), which represents the constant effect of an explanatory variable \(x\) on the likelihood that one outcome will occur, can be obtained from

\[
\text{OR} = \exp(\beta)
\]

The odds ratio is a measure of effect size and therefore provides information on the strength of relationship between the dependent and independent variables. When the value of OR is equal to 1, the explanatory variable does not affect the outcome; when OR > 1, a unit increase in the explanatory variable will increase the odds of the outcome by the value of OR; when OR < 1, a unit increase in the explanatory variable will decrease the odds of the outcome by the value of OR. Rosenthal (1996) develops qualitative descriptors of effect size for the odds ratio: OR values about 1.5 = small effect (or weak association), about 2.5 = medium (or moderate), about 4 = large (or strong), about 10 = very large (or very strong) (Rosenthal, 1996).

Figure 4.1 shows the general form of the relationship between dependent and independent variables in logistic regression.
Logistic regression is suited to address two research objectives: 1) to identify independent variables that impact group membership in the dependent variable; and 2) establish a classification system based on the logistic model for determining group membership (Hair, Black, Babin, & Anderson, 2009).

Logistic regression was employed in this study since it is the preferred method for two-group (binary) dependent variables due to its robustness, ease of interpretation and diagnostics. Its relative strength comes in its ability to be flexible across multiple research settings, its robustness derived from a minimal set of underlying assumptions, and its similarity to multiple regression for purposes of interpretation (Hair, Black, Babin, & Anderson, 2009). It is used extensively in numerous disciplines, including medical, social science, engineering, and market research fields.

In this study, logistic regression analysis was used in analyzing the survey data to identify the significant explanatory variables and their impact on the usage of online government portals.

5. Results and Discussion

A fully effective (i.e., all answers or responses to the set of questions in the survey questionnaire were considered effective) 100% response rate was achieved since household surveys were conducted through face-to-face interviews by SWS.

5.1 Presentation of Survey Results Using Frequency Statistics

The following subsections present and summarize the aggregated responses of respondents to survey questions on access to ICTs and the Internet; attitude towards e-government; and awareness and adoption of e-government.
5.1.1 Socio-demographic Characteristics of Survey Respondents

**Figure 5.1:** Frequency Distribution Graphs of Socio-demographic Indicators, N=1,200

Source: Authors
5.1.2 Access to ICTs and the Internet

**Figure 5.2:** Aggregated Responses on ‘Household Ownership of Computer and Internet Use’, N=1,200
Source: Authors

**Figure 5.3:** Aggregated Responses on ‘Frequency of Internet Use’, N=383
Source: Authors

**Figure 5.4:** Aggregated Responses on ‘Types of Activities Undertaken using the Internet’ (Multiple Answers), N=383
Source: Authors
5.1.3 Attitudes toward E-Government

5.1.4 Awareness and Adoption of E-Government
### Figure 5.9: Common Government Information or Services Accessed Through Government Websites (Multiple Answers), N=104

Source: Authors

<table>
<thead>
<tr>
<th>Service</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Security Benefits</td>
<td>58</td>
</tr>
<tr>
<td>Employment/Job Application</td>
<td>46</td>
</tr>
<tr>
<td>Health Services</td>
<td>34</td>
</tr>
<tr>
<td>Education</td>
<td>28</td>
</tr>
<tr>
<td>Immigration/Consular Services</td>
<td>27</td>
</tr>
<tr>
<td>Civil Registry</td>
<td>22</td>
</tr>
<tr>
<td>Taxation</td>
<td>21</td>
</tr>
<tr>
<td>Tourism</td>
<td>17</td>
</tr>
<tr>
<td>Election Affairs</td>
<td>13</td>
</tr>
<tr>
<td>Investment and Finance</td>
<td>11</td>
</tr>
<tr>
<td>Law and Justice</td>
<td>9</td>
</tr>
<tr>
<td>Transportation</td>
<td>9</td>
</tr>
<tr>
<td>Fire Safety and Disaster Prevention</td>
<td>6</td>
</tr>
<tr>
<td>Environment</td>
<td>6</td>
</tr>
<tr>
<td>Crime-Fighting and Prevention</td>
<td>5</td>
</tr>
<tr>
<td>Other Services</td>
<td>5</td>
</tr>
</tbody>
</table>

### Figure 5.10: Common Problems Experienced When Using Government Websites (Multiple Answers), N=104

Source: Authors

- No Problem, 63 (51%)
- Technical Failure in the Website, 29 (24%)
- Insufficient Information, 5 (4%)
- Inaccurate/Outdated Information, 3 (3%)
- Delayed Response to Inquiry or Delivery of Service, 20 (16%)
- Did not Respond to Inquiry for Service, 3 (2%)
5.2 Discussion of Survey Results

The following subsections present the descriptive analyses of the survey data presented above and some inferences supported by concepts obtained in literature.

5.2.1 Disparities in Access to ICTs and the Internet

The examination of the survey data shows that computer ownership and Internet use are generally low (Figure 5.2). With the disparities in household computer access and Internet use presented in the results of the survey, the presence of digital divide in the Philippines becomes more apparent. The lack of access to ICTs and the Internet is a manifestation of the existence of the digital divide. Where digital divide exists, access to the benefits of e-government is a challenge. According to Schradie (2011), the more frequently a person has access to the Internet, the more opportunities they have to gain the technology skills and the more time they have to be creative (Schradie, 2011).

5.2.2 Positive Attitudes toward E-Government

The respondents’ willingness to provide personal information on government websites suggests that they generally find e-government trustworthy (Figure 5.6). Also, majority of the respondents perceived government websites as useful in supplementing traditional government services delivery channels (Figure 5.7). This somehow reveals how they perceive traditional service delivery channels. With traditional channels, citizens have to visit, mail or call government bodies and wait for response from government officials. Despite their efforts in attempting to interact with government bodies through traditional means, sometimes citizens are left waiting for long periods of time and sometimes accessing government services through traditional channels tend to be more costly. With e-government, citizens can receive government information and services instantly from their homes or from anywhere with the use of a computer that is connected to the Internet. Results of the respondents’ reactions toward their willingness to provide their personal information on government websites and their perception on the usefulness of government websites reflect their general positive attitudes toward e-government. According to West (2005), the general public is a crucial factor in the dissemination of new technology. Owing to how they think about and utilize technology, individuals either facilitate or constrain change; if consumers are open to new technology or adept at integrating new inventions into their lives, they are going to be more receptive than if they harbor negative views about technological innovation (West, 2005).
5.2.3 Low Awareness and Adoption of E-Government

From Figure 5.8, awareness (35%) and use (9%) of government websites are generally low. Though awareness is a precondition for actual use, apparently it does not always lead to actual use.

The most commonly accessed government information or services through government websites are related with social security benefits, employment or job application and health services (Figure 5.9). While there are more e-government users that did not experience any problems with government websites, those who experienced problems mentioned technical failure in the website (e.g., website is inaccessible or unavailable, website contains broken links) and delayed response to inquiry or delivery of service (Figure 5.10) as the two most common problems. Furthermore, results show that the most identified primary reason for not using government websites is that respondents do not know how to use the Internet; and the most identified secondary and tertiary reasons are that respondents are unaware or familiar with government websites and they find it easier to just make personal visits to government offices, respectively (Figure 5.11).

5.3 Evaluating the Effects of the Explanatory Variables on the Outcome Variables Using Logistic Regression Analysis

Figure 5.12 generally describes the distinct research elements exhibiting the purported relationships that exist between the hypothesized explanatory and outcome variables of this study. According to Verdegem & Verleye (2009) and Van Dijk et al. (2008), intended users of e-government must be aware of the existence of electronic public services (in order to fulfil his or her needs) before the intention to use e-government services can arise (Verdegem & Verleye, 2009); (Van Dijk, Peters, & Ebbers, 2008). Since awareness is a precondition for adoption, it is deemed prudent to also investigate the effects of the potential explanatory variables on the outcome variable “awareness of e-government”.

![Figure 5.12: Conceptual Framework of the Study](source: Authors)

5.3.1 Logistic Regression Modelling

A total of 13 potential explanatory variables were considered in the design of the two logistic regression models corresponding to the two outcome variables awareness and adoption of e-government. While there are a total of 1,200 samples in the study, there were only 419 respondents who were aware of government websites. Correspondingly, the number of observations in the logistic regression model for “awareness of e-government” is 1,200 and the number of observations in the model for “adoption of e-government” is 419.
Logistic regression is used to find the best fitting model to describe the relationship between the dichotomous outcome variable and a set of explanatory variables. While the outcome variable takes the values 0 or 1, the potential explanatory variables were characterized into categorical and continuous variables in order to fit them in the logistic regression model. Table 5.1 describes how the outcome and the potential explanatory variables are fitted in the logistic regression models.

**Table 5.1: List of Independent and Dependent Variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>=18 and above, continuous variable</td>
</tr>
<tr>
<td>Gender</td>
<td>=1 if male; = 0 if female</td>
</tr>
<tr>
<td>Educational Attainment (measured in years of schooling)</td>
<td>=0 if did not finish elementary school; =6 if completed elementary school; =10 if completed high school; =12 if completed vocational school; =14 if completed college; =16 if undertaken post-graduate studies</td>
</tr>
<tr>
<td>Socioeconomic Status</td>
<td>=1 if Class E; =3 if Class D; =10 if Class C; = 30 if Class AB [values were based on the ratio of average incomes of the different social classes established by SWS (Africa, 2011)]</td>
</tr>
<tr>
<td>Status of Employment</td>
<td>=1 if employed; =0 if unemployed</td>
</tr>
<tr>
<td>Type of Settlement</td>
<td>=1 if urban; =0 if rural</td>
</tr>
<tr>
<td>Geographic Location</td>
<td>=1 if NCR; =0 if Balance Luzon, Visayas or Mindanao</td>
</tr>
<tr>
<td>Internet Use</td>
<td>=1 if use; =0 if non-use</td>
</tr>
<tr>
<td>Frequency of Internet Use</td>
<td>=1 if at least 3-5 days a week; =0 if less than 3-5 days a week</td>
</tr>
<tr>
<td>Breadth of Internet Use</td>
<td>=1 to 9, continuous variable</td>
</tr>
<tr>
<td>Household Ownership of Computer</td>
<td>=1 if yes; =0 if no</td>
</tr>
<tr>
<td>Trust in E-Government</td>
<td>=1 if at least somewhat willing to provide personal information on government websites; =0 if other response (i.e., somewhat unwilling, very unwilling or undecided)</td>
</tr>
<tr>
<td>Perceived Usefulness of E-Government</td>
<td>=1 if at least somewhat useful; =0 if other response (i.e., not very useful, not at all useful or undecided)</td>
</tr>
<tr>
<td>Awareness of E-government</td>
<td>=1 if aware of government websites; =0 if not aware of government websites</td>
</tr>
<tr>
<td>Adoption of E-government</td>
<td>=1 if used/visited government websites; =0 not use/visit government websites</td>
</tr>
</tbody>
</table>

Source: Authors

5.3.2 Results and Evaluation of the Logistic Regression Models

Table 5.2 show the results of the logistic regression analysis.

**Table 5.2: Logistic Regression Results (Odds Ratios)**

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>E-Government Outcome Variables</th>
<th>Awareness</th>
<th>Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td>1.00</td>
<td>0.96</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>0.91</td>
<td>1.10</td>
</tr>
<tr>
<td>Educational Attainment</td>
<td></td>
<td>1.12**</td>
<td>1.34**</td>
</tr>
<tr>
<td>Socioeconomic Status</td>
<td></td>
<td>1.02</td>
<td>1.06</td>
</tr>
<tr>
<td>Status of Employment</td>
<td></td>
<td>2.12**</td>
<td>0.98</td>
</tr>
<tr>
<td>Geographic Location</td>
<td></td>
<td>1.27</td>
<td>1.81</td>
</tr>
<tr>
<td>Type of Settlement</td>
<td></td>
<td>1.13</td>
<td>0.63</td>
</tr>
<tr>
<td>Internet Use</td>
<td></td>
<td>1.24</td>
<td>0.98</td>
</tr>
<tr>
<td>Frequency of Internet Use</td>
<td></td>
<td>1.44</td>
<td>1.45</td>
</tr>
<tr>
<td>Breadth of Internet Use</td>
<td></td>
<td>1.30**</td>
<td>1.43**</td>
</tr>
<tr>
<td>Household Ownership of Computer</td>
<td></td>
<td>0.97</td>
<td>4.36**</td>
</tr>
</tbody>
</table>
### Explanatory Variables vs. E-Government Outcome Variables

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>E-Government Outcome Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Awareness</td>
</tr>
<tr>
<td>Trust in E-Government</td>
<td>1.16</td>
</tr>
<tr>
<td>Perceived Usefulness of E-Government</td>
<td><strong>1.82</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>No. of Observations</th>
<th>Maximum-likelihood Estimation</th>
<th>Chi-squared, (13)</th>
<th>Prob&gt;Chi-Squared</th>
<th>Pseudo R-squared</th>
<th>Mean VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,200</td>
<td>-645.78</td>
<td>261.07</td>
<td>0.00</td>
<td>0.17</td>
<td>1.97</td>
</tr>
</tbody>
</table>

**p-value is < .01 significance level**

Based on the results of the logistic regression analysis, both the awareness and adoption logistic regression models were found to be statistically significant (given the resulting p-value <0.05 significance level associated with the likelihood ratio chi-squared test with 13 degrees of freedom). The significance test for the model chi-square is a statistical evidence of the presence of a relationship between the dependent variable and the combination of the independent variables. Results show that there are statistically significant overall relationships between the combination of independent and the dependent variables for the awareness and adoption models. The variance inflation factor (VIF) for the independent variables are within tolerable levels (ranges from 1.10-5.11), thus multicollinearity was not a concern.

#### 5.3.3 Interpretations of Logistic Regression Results

Tables 5.3 and 5.4 provide some qualitative interpretations of the obtained odds ratio values of the explanatory variables for the two logistic regression models based on the qualitative descriptors of effect size for the odds ratio developed by Rosenthal (1996).

#### Table 5.3: Qualitative Interpretations of Odds Ratio Values of the Explanatory Variables for Awareness of E-Government

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Odds Ratio</th>
<th>Qualitative Descriptors of Strength of Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status of Employment</td>
<td>2.12</td>
<td>Moderate</td>
</tr>
<tr>
<td>Perceived Usefulness of E-Government</td>
<td>1.82</td>
<td>Weak</td>
</tr>
<tr>
<td>Breadth of Internet Use</td>
<td>1.30</td>
<td>Weak</td>
</tr>
<tr>
<td>Educational Attainment</td>
<td>1.12</td>
<td>Weak</td>
</tr>
</tbody>
</table>

*Source: Author*

#### Table 5.4: Qualitative Interpretations of Odds Ratio Values of the Explanatory Variables for Adoption of E-Government

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Odds Ratio</th>
<th>Qualitative Descriptors of Strength of Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Ownership of Computer</td>
<td>4.36</td>
<td>Strong</td>
</tr>
<tr>
<td>Perceived Usefulness of E-Government</td>
<td>3.73</td>
<td>Strong</td>
</tr>
<tr>
<td>Breadth of Internet Use</td>
<td>1.43</td>
<td>Weak</td>
</tr>
<tr>
<td>Educational Attainment</td>
<td>1.34</td>
<td>Weak</td>
</tr>
</tbody>
</table>

*Source: Author*

The logistic regression analysis on the “awareness of e-government model” reveals that the effects of explanatory variables “status of employment”, “perceived usefulness of e-government”, “breadth of Internet
use” and “educational attainment” (i.e., in descending degrees of impact) on “awareness of e-government” are significant. All four identified explanatory variables in the model were found to have positive effects/influences on the odds of the outcome variable “awareness of e-government”.

On the other hand, the logistic regression analysis on the “adoption of e-government model” uncovers that the effects of “household ownership of computer”, “perceived usefulness of e-government”, “breadth of Internet use” and “educational attainment” (i.e., in descending degrees of impact) on the adoption of e-government are significant. All four identified explanatory variables in the model were found to have positive effects/influences on the odds of the outcome variable “adoption of e-government”.

In summary, it may be inferred from the results of the study that individuals who are employed, who perceive e-government as useful, who are more skilled in using the Internet and have generally higher educational attainment are most likely to be aware of e-government. Moreover, individuals who can access computers at their home, who perceive e-government as useful, who are more skilled in using the Internet and have generally higher educational attainment are most likely to use government websites.

6. Conclusions

The study has revealed the state of adoption of ICTs, the Internet and e-government by adult citizens in the Philippines. It has reviewed several literature on the factors affecting e-government adoption in order to adequately analyze the trends or patterns in the access of government information and services through online channels across several segments and attributes of the Philippine population. It has employed inferential statistics to complement the descriptive statistical analysis conducted on the survey data of the study. By conducting logistic regression analysis, the study was successful in identifying significant potential predictors of e-government adoption in the Philippines. The results of the study further validate, to some degree, the findings of other empirical studies on e-government adoption found in literature. While results of some empirical studies that were based on theoretical frameworks on e-government adoption in literature differ in findings, this study offers another way of understanding, analyzing and designing a process to investigate the relationships among variables concerning the adoption of e-government.

The following conclusions are drawn with respect to the objectives of the study.

6.1 State of E-Government Adoption by Citizens in the Philippines

The results of the study make the existence of digital divide in the Philippines apparent. The findings indicate that there are disparities in the access to ICTs and the Internet as well as in the patterns of Internet use among the various socio-demographic groups within country. This divide impedes equality in access to information and opportunities that can be benefitted from innovating technologies. Moreover, this is seen as a challenge in the provision of government information and services through the Internet or to e-government adoption in general. This study confirms that a large portion of the population in the Philippines has not yet accessed online government portals. One of major reasons inferred is the lack of familiarity with government information and services offered over the Internet. Though promoting awareness of e-government to citizens does not ensure their adoption of e-government, it gives citizens more flexibility on how they would want to communicate or interact with the government (i.e., either through electronic or traditional service delivery channels). On the other hand, if the benefits of e-government are properly conveyed, the adoption of e-government is deemed optimistic.

6.2 Effects of Socio-demographic Factors, Access to ICTs and the Internet, and Attitudes toward E-government on the Awareness and Adoption of E-government in the Philippines

The study has successfully examined the significance of several potential predictors of awareness and, ultimately the usage of online government service channels. The combination of socio-demographic factors, access to ICTs and the Internet, and attitudes toward e-government affects the awareness and adoption of e-government among citizens. Despite the low awareness and adoption of e-government in the country, the study further reveals that citizens in the Philippines have positive general attitudes toward e-government. Their willingness to provide personal information on government websites expressed their trust in the system and their positive general perception on the usefulness of electronic service delivery channels conveys their receptivity to adopt e-government.
Acknowledgments

The authors would like to thank the staff of the Social Weather Stations for their collaborative effort in conducting the survey, which produced data that were essential in this study.

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Factors Affecting the Adoption of e-Government in Kuwait: A Qualitative Study

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Abstract: Previous research on information quality and organizations performance focuses on private sectors and pays little attention to governments and public organizations. To the best of the researchers’ knowledge, e-Government success literature has rarely investigated information quality as a contributor to the success of e-Government initiatives in Kuwait. This paper aims to understand the factors that may influence or hinder for enabling e-Government strategic benefits in Kuwait. Data were collected from 31 employees through one-on-one interviews at three e-Government Kuwaiti agencies namely, Ministry of Justice, Ministry of Finance and Public Authority for Civil Communication. The study findings revealed that several themes (i.e. information quality, strategic benefits, and institutional values) were observed to achieve better e-Government Benefits. The research also reveals some new drivers (Cost saving and customer satisfaction) and barriers (e.g. Nepotism and Wasta) to improving organizational performance. These results and their implications to both theory and practice are described.

Keywords: Information Quality, Organizational performance, E-government, Qualitative research, Kuwait, Arab World.

1. Introduction

E-Government services increasingly centre on the needs of both citizens and businesses. At the same time, government leaders and e-Government proponents seek streamlined and efficient internal transactions and services. This requires the interoperation and collaboration of government agencies and their respective Electronic Government Information Systems (EGIS) across different levels and departments (Wohlers et al., 2012; Yusuf et al., 2016). The core issue of e-Government integration and interoperation is information sharing (Scholl and Klischewski, 2007). Yet, information can be shared on fairly different levels of quality and in many different ways, requiring different degrees of integration (Pedersen, 2016; Oni et al., 2016). Furthermore, government organizations who engage in information sharing projects tend to have multiple views on the required quality of information exchanged. Information sharing participants’ perceptions of information quality vary, and dependent on their role (information providers, users, and managers) (Alenezi et al., 2015). Different perceptions of these participants need to be understood in order to enable organizations to better manage their resources and operation.

A considerable amount of literature is published on information quality dimensions and assessments (e.g. Wang and Strong, 1996; Kumar et al., 2007; Masa’deh, 2012; Jimenez et al., 2014), organizational performance assessment (e.g. Masa’deh, 2013; Abbasi et al., 2015; Obeidat et al., 2016) and e-Government benefits (e.g. Li and Feeney, 2014; Alenezi et al., 2015). There is also a growing body of literature that focuses on the relationships between information quality and organizational performance (e.g. Kerr and Norris, 2004; Batini et al., 2009). However, detailed explanation of these relationships is either non-existent or insufficient (Jaklič et al., 2011; Alenezi et al., 2015). Only few studies discussed the direct connection between information quality and organizational performance. For instance, Campbell et al., (2004) investigated the linkage between information strategy and organizational performance and demonstrated that there is a positive link between information quality and organizational performance by calculating the return on investment. This conclusion is also supported by the findings of the cost-benefit analysis conducted by Kerr and Norris (2004) and Alenezi et al. (2015). Slone’s (2006) conducted a comprehensive study of these links and noted that the organizational performance can be can be improved by focusing on information quality. Although the aforementioned studies contributed greatly in developing an understanding of the impact of the information quality on organizational performance, they did not offer answers to the questions of how and why information quality affects organizational performance. Having highlighted some limitations of the literature to date, this research fills the

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gap in understanding the relationships between information quality and organizational performance. Thus, this research acquired an in-depth explanation and understanding on factors that may influence or hinder for enabling e-Government strategic benefits in Kuwait.

The structure of the paper is as follows. Section 2 reviews the relating literature. Section 3 presents the research methodology used in this study. Data analysis and result discussion are presented Section 4 and 5 respectively. Section 6 concludes the paper.

2. Literature Review

2.1 Information Quality

Considerable research attention has focused on the need for a rigorous definition of information quality (e.g. Wang and Strong, 1996; Obeidat et al., 2012; Ayala and Franch, 2014, Alenezi et al., 2015; Sharma et al., 2017). In 1958, for instance, Maffei wrote, “a theory of the cost and value of information is needed. We need to know quantitatively what price is being paid by deviating from a ‘best’ course of action and weigh this against the cost of getting better information” (Maffei, 1958). In describing this as a cost issue, Maffei was referring to cost in the broadest possible sense, including such notions as opportunity cost and the cost of making poor decisions based on inferior information. Similarly, Trueblood (1960) focused on what was at the time the newly emerging field of operations research. As he defined it, “the purpose of operations research is not to replace management judgment but to provide more and better information”. Academics and practitioners have defined the concept of quality in different ways and perspectives. For example, among the earliest proponents of quality as a management concept was W. Edwards Deming, best known for his contribution to the industrial reconstruction of Japan after World War II. In recognition of this work, the Japanese Union of Scientists and Engineers established the Deming Prize in 1951 to distinguish businesses, which achieved a certain level of quality. Deming (1982) asserted that quality improvements inevitably lead to productivity improvements, hence enhancements in competitive position. In Deming’s view, low quality wastes effort and production capacity and causes reworking, each of which brings down productivity, increases cost and has the potential to damage a firm’s reputation.

Information quality literature provides a detailed classification of the dimensions of data quality; however, most dimensions contain discrepancies in their definition owing to the contextual nature of quality. The six most important classifications of quality dimensions are provided by Jarke et al. (1995); Wang and Strong (1996) and Wand and Wang (1996). By analyzing these classifications, Catarci and Scannapieco (2002) reported that a basic set of data quality dimensions, namely, accuracy, completeness, consistency and timeliness, which form the focus of most studies, can be defined. Indeed, Wang and Strong (1996) define accuracy in terms of the extent to which data are seen to be correct, reliable and certified. Michnik and Lo (2009) specify that data are accurate when the data values stored in the database correspond to real-world values. Completeness is defined as the degree to which a given data collection includes all the data describing the corresponding set of real-world objects and entities (Alenezi et al., 2015). The consistency dimension refers to the violation of semantic rules defined over a set of data items. With reference to the relational theory, integrity constraints are a type of such semantic rules. In the statistical field, data edits are typical of the semantic rules allowing for consistency checks (Batini et al., 2009). A vital aspect of data is of being updated over time. The main time-related dimensions proposed in the literature are currency, volatility and timeliness. Redman (2005) provide very similar definitions for timeliness and currency. Liu and Chi (2002) assume the same meaning for timeliness, while Bovee et al., (2003) provide a definition for timeliness in terms of currency and volatility. The definition of currency expressed in Bovee et al., (2003) corresponds to timeliness as defined by Liu and Chi, (2002). This comparison shows that there is no agreement on the abstract definition of time-related dimensions; typically, currency and timeliness are often used to refer to the same concept.

Batini et al. (2009) however argues that there is no general agreement as to which set of dimensions defines the quality neither of information nor on the exact meaning of each dimension. Furthermore, major approaches to managing information quality, namely, Total Data Quality Management (TDQM); data production maps and benchmarking are discussed. Most of the frameworks and approaches proposed for managing information quality are derived from an analogy between physical product manufacturing and information product manufacturing (Wang et al., 1995; Wang and Strong, 1996; Wang et al., 1998; Scannapiecoet al., 2005; Smith et al., 2014).
2.2 Quality of Information in e-Government Services

Essential to the ability to manage something is the ability to measure it; managing information quality therefore may not be done properly without measuring it appropriately (Tarhini et al., 2015; Sharma et al., 2015). Ballou and Pazer, (1985) recognized that information quality is a relative rather than absolute term. In support of their work, they proposed a model for evaluating the magnitude of errors. They also identified four dimensions as relevant: accuracy, timeliness, completeness and consistency, and proposed measurements for each in terms of its differential in relation to some reference point. Taking a rather different approach, Agmon and Ahituv (1987) applied the concepts of quality control theory, as used in industrial engineering, to the issue of data reliability in information systems. In doing so, they subdivided the concept of data reliability into three components: internal reliability, relative reliability, and absolute reliability. In their use of the terms, internal reliability is most closely associated with what they call commonly accepted data use and characteristics, such as allowing positive values for quantities only in an inventory control system. Relative reliability is measured against user requirements, such as requiring that every vendor should have the name field specified. Absolute reliability is measured against experience and verified by observation (Zeist and Hendricks, 1996).

Against this backdrop, many researchers remained focused mainly on accuracy, considering others of less importance. Paradice and Fuerst (1991), who focused their efforts on a proposed formula for computing a stored error rate, defined this as a combination of the ratio of a particular data element classified as being in error and the percentage of times when the element was classified as correct, weighted by the probability, as measured by random samples, that any given element will be in error. Despite their limited focus, Paradice and Fuerst (1991) provided a valuable contribution to the field of data quality management. For instance, while noting that nearly all the previous literature they had reviewed relied upon the use of internal control processes, such as audits, rather than a quantifiable mechanism such as a calculated error rate, they observed a lack of research seeking to apply the quality control methods of manufacturing to information processing. In this context, Paradice and Fuerst (1991) proposed the metaphor of data as raw material being consumed by a data manufacturing system to produce information. They however, noted that data unlike most raw materials is not consumed when processed and therefore may be reused repeatedly.

Some of the main goals of e-Government are to improve the quality of the service, increase the efficiency of administrative processes and enable governments to more effectively participate and engage with service users (Helbig et al., 2009; Nripendra and Dwivedi, 2015). Hence, the attainment of e-Government goals is of strategic importance for governments. The benefits to be expected from the previously discussed strategies, such as better services, operational savings and increased programme effectiveness, can be gained from these information-sharing initiatives (Zheng et al., 2009). Nevertheless, researchers such as Scott et al., (2011) and Zheng et al. (2013) suggest that little research has been conducted into identifying the measures that determine e-Government success when enhancing the capacity to share information between organizations.

The focus of the project was on improving the organizational service of the agencies involved by improving the quality of the information which they could collect, maintain and provide, and by improving the sharing of this information between agencies. E-Government websites have as their main goal to provide better and more convenient services to citizens and institutions (Gouscoset al., 2007; Dolson and Young, 2012; Casalino, 2014). Less time is spent on travelling and waiting. In addition, online services are quicker than face-to-face services. From the government’s standpoint, the more citizens use e-Government initiatives which are designed to alleviate the problem of having access to information and improve government services, the more operation and management costs are reduced (Gouscos et al., 2007; Shareef et al., 2011). For these reasons, governments around the world are making their services available online via e-Government websites such as South Korea, South Africa and Nigeria. In addition, several researchers (e.g. Yang and Wu, 2014) concluded that the significant barriers affecting the use of e-Government websites were the lack of information about which e-Government websites should be used and which services were available, the lack of the desired information or application forms, insufficient instructions, low confidence in the system and its slowness. By contrast, their study showed that the attractiveness of e-Government websites and confidence in the security of the system were inducements. In their research, of adaption and use of e-Government websites, Colesca and Dobrica (2008) revealed that the users’ higher perception of usefulness, ease of use, quality and trust of e-Government services directly enhanced their satisfaction and implicitly the level of adoption of e-Government.
3. Research Methodology

This research takes the interpretive approach with the use of semi-structured interviews to understand the factors that may influence or hinder for enabling e-Government strategic benefits in Kuwait.

Irani et al., (2005) classified research paradigms in Information Systems into two paradigms, behavioral science and design science. According to Irani et al., (2005), the design science leads to create artifacts to provide solutions for business problems, whereas the behavioral science seeks to develop and justify theories explaining or predicting organizational and human behavior. Based on that, the present study can be classified under the behavioral science paradigm. In addition, methods, techniques and approaches sometimes are used interchangeably to execute tasks within the procedures of the methodology. Since IS, is multi-disciplinary with many of its aspects related to specialized subjects, the identification of an appropriate research approach is not a simple task. In addition, there is no single framework that includes all the domains of knowledge needed for the study of IS (Irani et al., 2005). The information quality literature exemplifies the notion that multiple paradigms can and do survive alongside one another. Research on the topic spans multiple paradigms and includes the use of a wide assortment of methodological approaches, depending on the research question under consideration. As such, within the information quality field, the ability for an individual researcher to flexibly select from among multiple paradigms and multiple methodologies is seen as advantageous. This ability fits well within what Greene et al., (2005) referred to as the “pragmatic stance”, which they described as “an inclusive philosophical framework within which multiple assumptions and diverse methods can comfortably reside” (p. 275).

3.1 Semi-Structured Interviews

Semi-structured interviewing (i.e., one way of conducting interviews) entails the interviewer a list of questions on topics referred to as an interview guide (Bryman & Bell, 2007). Also, semi-structured interview allows interviewees to talk freely about events, quality and strategy in relation to what they thought about improving information quality levels. Thus, the semi-structured interview method will be used for this study.

3.2 Research Design and Data Collection

Interviews can be highly structured, semi-structured or unstructured. In structured interviews interviewers ask each participant the same questions in the same way. A tightly structured schedule of questions is used, very much like that of a written questionnaire. The questions may even be phrased in such a way as to elicit a limited range of response. For example: “Do you think that the information quality in your organization is excellent, good, average or poor?” Bearing in mind the cost of conducting a series of one to one interviews, any researcher planning to use structured interviews should carefully consider whether the information could be more efficiently collected using questionnaires. This research has been accomplished through data collection from different public-sector organizations. First, three in-depth interviews were conducted after developing the final interview and before the pilot study commenced. The main goal of these interviews was to ensure that the meaning of the constructs under investigation was perceived correctly, and as expected by the researcher. The interviews also provided a validity check on the meaningfulness of the strategic benefits, transparency, and institutional value. The semi-structured interviews are informal that give the interviewee the chance to talk freely about events, quality and strategy in relation to what they thought about improving information quality levels. The qualitative interviews are conducted face-to-face, communicating directly by the author. Interviews are conducted with government management employees from different organizations that perform the roles of Information Providers, Information Managers, and Information Users. An example of interview’s weaknesses is that a poorly constructed interview can create bias in the interviewee’s answers (Yin, 2003). An example of a research weakness was highlighted by (Denscombe, 2007) is reflexivity, where the interviewee answers the content that interviewer wants to hear. In the interviews conducted with managers (as part of this research), they were advised that their individual participation was voluntary and that they could discontinue participation at any time. Furthermore, participants were not paid for their participation.

The primary source of data for this study was interviews conducted in Kuwait. Indeed, qualitative data were collected through interviews of selected managers and employees representing all types of participants (information providers, information managers, and information users). Consequently, participants identified in the sample are all positioned in the Kuwait government ministries. Those participants who decided to participate in the managers and employees interviews agreed to an interview schedule with the author. Complete interviews were recorded electronically, and saved only in the author’s personal computer.
Interviews are conducted with government management employees from different organizations that perform the roles of Information Providers (10 participants), Information Managers (7 participants), and Information Users (14 participants). Information systems used by the participants range from web portals, which enable public to participate in local governance activates, payments gateways, which provide alternative channels to pay for the governmental services, to static websites, which provide basic services and information for citizens.

3.3 Qualitative Analysis

There are different types of qualitative data analysis have been used across various areas of research. The two most popular types of qualitative data analysis are content and thematic analysis (Braun and Clarke, 2006). They are both used to develop a framework for describing and organizing qualitative data (Patton, 2002). In this research, the thematic analysis was used to analyze the qualitative data. Thematic analysis includes organizing principles within data into themes according to their similarities. There are a variety of steps and phases used to perform thematic analysis (Braun and Clarke, 2006). For the purpose of this research, four steps were applied following those of Braun and Clarke (2006).

- Getting familiar with data.
- Generating initial codes and themes.
- Searching for themes.
- Reviewing codes and developing analytical themes.

3.3.1 Getting Familiar with Data

This section provides some background about the interviewees including: gender, age, information sharing rule and occupation. Three e-Government agencies (A1, A2 and A3) were selected to conduct interviews namely, Ministry of Justice (A1), Ministry of Finance (A2) and Public Authority for Civil Communication (A3). To ensure a representative sample, the author collected qualitative data by conducting interviews with 31 participants. Table 1 presents a summary for the demographic characteristics and the profiles of the interviewees.

Table 1: Information on Demographic Characteristics and Profiles of the Interviewees

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Description</th>
</tr>
</thead>
</table>
| Average Age                 | A1: 30 years  
|                             | A2: 27 years  
|                             | A3: 33 years  |
| Gender                      | A1: Male 6, Female 4  
|                             | A2: Male 6, Female 5  
|                             | A3: Male 7, Female 4  |
| Educational level           | A1: High School & below 2, Diploma 3, Bachelor 3, Higher Education 2  
|                             | A2: High School & below 2, Diploma 4, Bachelor 4, Higher Education 1  
|                             | A3: High School & below 2, Diploma 3, Bachelor 3, Higher Education 3  |
| Information Sharing Rule    | A1: Users 4, Providers 3, Managers 3  
|                             | A2: Users 3, Providers 4, Managers 4  
|                             | A3: Users 4, Providers 3, Managers 4  |
| Occupation                  | A1: Employee 4, Section Head 4, Manager 2, Director or above 0  
|                             | A2: Employee 3, Section Head 1, Manager 2, Director or above 1  
|                             | A3: Employee 4, Section Head 3, Manager 2, Director or above 2  |

3.3.2 Generating Initial Codes and Themes

There are two methods that can be used to generate codes and themes, manual and computer-assisted methods. In this study, the manual method was used as it allows more flexibility and also makes it easier to get the big picture from the data. To generate the codes, different colour highlighters and multiple folders were used. In addition, multiple readings of the transcripts were undertaken to allow the development of principles and constructs regarding potential codes. The next section presents the results of searching for themes and codes, through interview quotes, to gather interview-based codes.
3.3.3 Searching for Themes

This section discusses some of the research findings derived from the analysis of the interview data. These findings emerged from the process of reading and reviewing of text segments. The collected codes were grouped into sub-themes and themes. The themes, sub-themes and codes identified can be shown in Table 2.

Table 2: List of themes, sub-themes and codes

<table>
<thead>
<tr>
<th>Themes</th>
<th>Sub-themes</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Quality</td>
<td>Sound Information</td>
<td>Accuracy, Completeness</td>
</tr>
<tr>
<td></td>
<td>Useful Information</td>
<td>Objectivity, Interpretability, Relevancy</td>
</tr>
<tr>
<td></td>
<td>Dependable Information</td>
<td>Security, Timeliness</td>
</tr>
<tr>
<td></td>
<td>Usable Information</td>
<td>Believability, Accessibility, Value added</td>
</tr>
<tr>
<td>Strategic Benefits</td>
<td>Costs</td>
<td>Costs savings, Time and efforts</td>
</tr>
<tr>
<td></td>
<td>Decision Making</td>
<td>Agility and efficiency, Empowerment</td>
</tr>
<tr>
<td></td>
<td>Service Quality</td>
<td>New and Innovative e-Services</td>
</tr>
<tr>
<td>Institutional Values</td>
<td>Institutional Image</td>
<td>Responsibility</td>
</tr>
<tr>
<td></td>
<td>Credibility</td>
<td>Transparency, Accountability</td>
</tr>
</tbody>
</table>

4. Data Analysis

This section presents the findings of the qualitative data analyzed using thematic methods explained in the data analysis section. A thematic analysis of semi-structure interviews with stakeholders in three governmental agencies, namely, Ministry of Justice (A1), Ministry of Finance (A2) and Public Authority for Civil Communication (A3) were conducted. Ministry of Justice is one of the important ministries in Kuwait as it encompasses many departments which receive thousands of transactions from both citizens and businesses. Its work spans a wide range of legal and Justice Issues, including criminal, civil justice, arbitration and democracy and rights. Ministry of Finance is one of the central and core agencies of Kuwaiti government. It is responsible for the public treasury, state investment, central bank, fields of international economic cooperation, budget implementation and monetary investment. The third agency is the Public Authority for Civil Communication. It is a government agency responsible for registration of population and issuing birth, death, marriage and divorce certificates as well as collecting statistics related to all civil events.

4.1 Information Quality Theme

This theme highlights the four dimensions of information, the soundness, usefulness, dependability and usability of the information produced by the e-Government websites and services. It also shows how the users perceive the product quality of information produced and the service quality of the information from the government.

4.1.1 Sound information

The findings show that sound information described as information that conforms to specific standards of quality such as accuracy and completeness contribute to both use and user satisfaction. It is closely associated with system use and net benefits, more significant than other criteria and influences the adoption of government websites (DeLone and McLean, 1992). Sound information was seen by many participants as a prerequisite to provide timely and efficient services. The importance of sound information on strategic benefits was emphasized on multiple segments in the text. In addition, many participants went beyond the link between strategic benefit and information quality to demonstrate the relationship between sound information and organizational performance. Some participants stated that sound information can lead to an increase use of e-Government services, while others indicated that sound information can improve the institution’s image.
Accuracy

Most of the participants describe the quality of information provided by government websites as accurate and of high standard capable of enhancing their business goals and objectives. There has been a remarkable improvement in the soundness of the information provided by government which has resulted into an increased confidence and reliance on government information by the users. The following quotes highlight one participant perception about the importance of information accuracy.

“There is a remarkable improvement in the level and quality of information provided by government websites. Its accuracy cannot be faulted and we therefore find it reliable as we use it to pursue our business goals” [A1, User]

Participants appreciate the efforts of the government departments in ensuring the production of accurate and reliable information targeted at the needs of the business users in the economy. These efforts are yielding good results and good image for the government.

“We are satisfied with the quality of information we get from our government websites, this has helped our business to move forward” [A2, User]

“We in the government are aware of the importance of information quality in terms of accuracy and reliability; we therefore focus on producing and delivering quality information to meet the needs of our clients in their various endeavors” [A1, Provider]

The emphasis on having product quality that conforms to required standards of information needed to meet the needs of the clientele was made by government departmental staff. It was highlighted that government is concerned about the poor quality of information usually associated with the government websites and services which has adversely affected business users in particular in recent times.

“We acknowledge the need to conform to standards of information quality as this is the only way the information produced and provided will be of any good to our customers. Our efforts are therefore focused in that direction” [A1, Manager]

Completeness

The study also confirms the government’s efforts in ensuring the provision of not just accurate information but sufficient information and details enough to assist the users in their business tasks. The user is able to have complete set of information in any required area and nothing is deliberately kept back or negligently missing. This was discovered to have helped the business users in efficiently and effectively carried out their tasks and meeting their customers’ demand.

“Having sufficient information makes you a complete organization ready to take any right decisions, deal with prevailing situations and the constantly changing demands of the clients” [A3, Manager]

Participants also highlighted the usefulness of the complete and sufficient information in providing cost-effective services to their clients. It has minimized the time delays and costs of getting all required vital information usually achieved by going round all the government departments and running after staff officers of the departments concerned.

“Complete information helps us to answer our customers’ questions quickly and effectively. It helps our staff to act quickly thereby providing better accurate and timely services to our clients” [A2, Manager]

4.1.2 Useful information

The objectivity, interpretability and relevancy of the information produced by government websites were major issues raised concerning the product quality as these determine the usefulness of information.

Objectivity
Concerns were raised about the objectivity of the information provided. While most participants believe the efforts of the government in providing complete information, the unbiased nature of the information may be of doubt. Participants are of the opinion that the government may have given out information that have been doctored to project the image of the government and to suit the best interest of the government. There is therefore the fear of the government providing information that is without bias, prejudices and impartiality.

“In as much as we trust in the accuracy of the information provided, it will still be preferred if the real information will not be replaced with government’s interpretation or opinion of the situation” [A1, Manager]

**Interpretability**

The product quality in terms of the appropriate symbols and languages used to enhance easy understanding and interpretability is however commendable. Information is given and translated in Arabic language which is the official language in the country. Familiar symbols are also used to emphasize the interpretation of the meanings of some sensitive information. The users are therefore at home with the information and are comfortable with it.

“We understand our culture and the demands of the society and their information requirements; therefore we keep the standards that are nationally accepted and used nationwide” [A3, User]

**Relevancy**

Participants also highlighted the issue of the information produced being helpful in accomplishing the tasks needed to be done in the business of the organization. Some participants however argue that most of the information produced by the government is not relevant in their businesses and therefore not applicable.

“Sometimes the information we get is not relevant to not just our business but general businesses, the government sometimes try to create an information overload with junks of information to sift relevant information which is time consuming and costly to most businesses” [A2, Provider]

**4.1.3 Dependable Information**

This sub-theme highlights the quality of information as a service provided by the government websites. The findings also confirm that participants were more concerned for the quality of information service in terms of the authenticity and security of the source of information, and the timely manner the information is released. In addition, the analysis revealed that Information Security is essential prerequisite for enabling e-Government. As seen by many interviewees, secure and timely sharing information is needed between the service providers and receivers to fulfil the fundamental security requirements: availability, integrity, confidentiality and control. Some of the interviewees correlated secure and timely information with cost reduction and ease of communication. Other interviewees linked between lack of security and increase in customers’ complaints. Interviewees who worked at the managerial level see that both service providers and receiver are sharing the responsibility to ensure that adequate information security measures are in place.

**Security**

The fear of unauthorized filtering or provision of unauthorized, unconfirmed and modified information was highlighted in the study. Doubts were raised about the efficiency of the process of passing information from one government department to the other. The possibility of introducing unauthenticated information or withdrawing authentic information raises doubt about the dependability of the information presented.

“The attitude of some government officials and the information sharing approach/system adopted by the government does not convince some of us of the ability of government websites to provide secured and dependable information” [A2, User]

“The integrity of information we use in our daily business is of paramount concern to us, our competitiveness in the industry depends very much on it, and we are therefore worried when we notice some lack of cooperation among government departments and some security lapses in the process of information sharing and processes” [A3, Provider]
Timeliness

Participants also agree that although the secured provision of information is important, but providing the information in its current state and in a timely manner gives the quality of dependability to the information. Again, some observed lack of cooperation among government departments may be slowing down the process and causing delays between the time information is received into the system and the time it is provided to the users.

“Time is of essence in our business that we rely on real-time information on events” [A2, User]

4.1.4 Usable information

This sub-theme also concerns the service quality of information and highlights the perception of the users on the credible nature of the information, the reputation of the source and the provisions made to enhance easy and effective access to the information made available. Participants were more concerned with believability, accessibility and the value added capacity of the information. Participants opined that users prefer information when it is believable and reputable, as well as beneficial.

Believability

Most participants agree to an extent that the information provided by the government websites is true and credible in spite of some chances of infiltration of the system and unauthorized modification by unauthorized people. The perceived security of the system and the obvious efforts by the government to improve the quality of information convinces the participants of the credibility of the information and the source.

“The government’s efforts and the introduction of state-of-art technologies have assured us and even the critics that we can believe the information we receive from the government” [A2, User]

Accessibility

Another major concern is the ease of data attainability and the time aspect of accessibility. Participants indicate that the ability to get access to needed information when it is needed most makes the information most usable. Participants agree that the needed information is usually available and most times can be easily and quickly retrieved by any user at any time. The websites are considered to be well designed with guides and helps to enhance direction and fast access to information. The search engines have been of tremendous help to users in finding easy and fast access to needed information.

“The websites are effectively designed to fast-track access to information” [A3, User]

“There is no restriction of access to any information put on the website; users are privileged to retrieve any information for use” [A2, User]

Value added

Participants highlighted the satisfaction gained and expectations achieved as a result of the use of the information provided by the government websites. The quality of the information assisted users in meeting their obligations to their clients which helped in meeting targets and business objectives. Participants therefore confirm that the information used as provided was beneficial and added value to their businesses.

“We are satisfied with the quality of the information as it meets our expectations” [A1, User]

Most participants also agree that providing added value information not only increases the use of e-Government, but also improves customers’ satisfaction. Some interviewees who do not have managerial responsibilities found that accessibility and believability are important enabler to increase adoption of the e-Government services.

“We do believe that providing value added services is essential to customer satisfaction. It also improves communication with our customers. Providing unbiased and credible information will be of enormous advantage not only to our customers, but also to our partners” [A2, Manager]
4.2 Strategic Benefits Theme

This theme highlights the participants' views on the benefits gained from the use of the government websites. The benefits are summed up in the cost savings achieved and the ease of the decision making process that enhanced agility and efficiency in the business organizations.

4.2.1 Costs

Participants are overwhelmed with the cost savings attributed to the quality of information provided by the government information services. The time taken to search for information from the various departments of government has been reduced to the barest minimum, which has also reduced the cost of information search and cost of doing business both with the government and the clients. The cost of obtaining information from other sources that were previously relied upon, has also been scrapped since participants now turn to the government services for more reliable and free information.

“The time delay usually experienced in the past when quantified is costly in terms of customer loss, overtime paid to staff, etc. The service provided by the government has indeed brought an end to such expensive time delays” [A2, Manager]

4.2.2 Decision-Making

Good quality information has been able to simplify the decision making process of businesses. Participants find it easy making good and quality decisions based on quality information that is readily available with unrestricted access. This has also enhanced business agility and efficiency in the ways businesses are conducted. Many interviewees link between information understandability and effective communications. Relevant information was identified by some interviewees as a necessary precondition for effective communications, while unbiased information recognized by many interviewees as an important driver of better decision-making.

“Information interpretability plays an important role in e-Government services. Easy to understand information helps us to alleviate confusion about procedures to receive e-Government services and reduce the need for further inquiries” [A1, User]

“Understandability is an essential characteristic of useful information. The lack of understandability complicates the realization of our service. Providing non-relevance information can lead to delaying our services and violate the people interest” [A3, Provider]

4.2.3 Service Quality

Sound information was seen by most participants as a prerequisite to provide timely and efficient services. The importance of sound information on strategic benefits was emphasized on multiple segments in the text. Some participants stated that sound information can lead to an increase use of e-Government services. Other participants indicated that sound information can improve the institution’s image.

“Complete information helps us to answer our customers’ questions quickly and effectively. In the case of presence of errors in the information, this can lead to delay our works and required us to back to our managers” [A1, User]

4.3 Institutional Value Theme

4.3.1 Institutional Image

Most of the information users found that completeness and error free constructs are the most important aspect of sound information, which has the strongest effect on institution image. Some interviewees with management responsibilities found consistency the most important aspect of sound information and considered it as a key to develop a professional image for the organizations.

“Providing concise and consistent information will not improve our institution image, but also helps reduce problem inquiries from our partners and customers. Concise and consistence representation supports systems integration between government organizations, and when we appear integrated it’s better for our image” [A3, Provider]
Appropriate amount and relevancy were seen by many interviewees as key qualifies of useful information, which influence institution image. Most of the information users correlated interpretability with ability of tracking and checking the states of e-Government services. Information managers and providers shared the same view in that relevant information is very important to organizations to save time and resources.

“I think interpretability and appropriate amount of information are the key attribute of useful information. Interpretability and appropriate amount make it easy to track and follow the status of our requests and orders and this clearly expressing the organization image” [A3, user]

Learning new services and participating in community activities were among the new codes emerged under this sub-theme. Most of the interview found that getting updated information is very essential for the image of any organization. Information users claimed that the availability of updated information encouraged them to learn about new services and participate in community activities. Most of the information managers found security issues is the key attribute of dependable information, which can affect the whole organization image. However, they affirmed that establishing and maintain adequate security measures are the responsibility of the whole community.

“Security issues play major role in shaping our institutional image. We work with our partners, providers and customers to ensure that adequate security measures are established and maintained. Access authority is well defined in our organization, and it provides us as managers a piece of mind especially in the case of sensitive information and increases our credibility in front of users and citizens” [A3, Manager]

4.3.2 Credibility

The code analysis under this sub-theme revealed that in order to maintain the credibility of an organization and to gain citizens trust, it is essential to deliver sound information. More specifically, some of the participants considered consistency and error free as a proxy for professionalism which in turn helps improve citizen retention and promotes the credibility of the organization.

“Sound Information creates confidence and respect to the work of government and enhance government image with employees and citizens. Consistency is a proxy for professionalism, which in turn helps to strengthen the institution’s image. Error free information is also important to building credibility in our services” [A2, Manager]

4.4 Differences among Information Sharing Participants

The comparison of code groups across different information sharing participants revealed two main differences: a) the perspective of the information sharing participants on the most important characteristics of information quality, and b) the time when the information quality benefits can be expected. Table 3 illustrates four dimensions of information quality considered in this research. Moreover, a list of the most important characteristics of these dimensions grouped by the roles of information sharing participants.

<table>
<thead>
<tr>
<th>Table 3: Dimensions of Information Quality grouped by the Roles of Information Sharing Participants</th>
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</thead>
<tbody>
<tr>
<td>Users</td>
</tr>
<tr>
<td>Sound Information</td>
</tr>
<tr>
<td>Dependable Information</td>
</tr>
<tr>
<td>Useful Information</td>
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<tr>
<td>Usable Information</td>
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</table>

On one hand, information users are more concerned about the attributes of information quality that can help them to complete their daily tasks and jobs. On the other hand, providers and managers are more concerned about the attributes that provide strategic advantages to e-Government services. The quote below provides some examples that demonstrate these differences between the information sharing participants.
“Complete information helps us to answer our customers’ questions quickly and effectively. In the case of presence of errors in the information, this can lead to delay our works and required us to back to our mangers” [A1, User]

4.5 Additional Benefits of Quality Information

Further thematic analysis also revealed other benefits of quality information on e-Government services. Some of these benefits represent almost purely individual gains such as personalisation, convenience, control and time saving. Other benefits are extended to the whole organization, including better decision support, reengineered business processes and cost saving. Although individual benefits may be small, the potential benefits for the organizations are huge. Moreover, there are also intangible benefits, which may impact organizational images and reputation such as enhancing transparency and reducing bureaucracy. The quote below support this insight and provide some of the additional benefits of quality information.

“Useful information should be appropriate in amount and relevant to ensure that it can be used to make informed decisions. Providing irrelevant information can confuse the services receivers and can damage the credibility and the image of any organization” [A1, Manager]

4.6 Challenges to the Benefits of Quality Information

Although the majority of interviewee recognized the benefits of quality information, they also noted some issues which may limit the benefits derived out from quality information. On the top of these issues are cultural and social influences. Other complicating factors that may hinder the benefits includes: lack of expertise and resistance to change. For example, managers from organizations A1 and A3, respectively, reported that:

“I think our society needs to know more about e-Government. If you ask anybody in the street, you will find the majority have no idea about it. Therefore, I think we need to raise the awareness about it before realize the benefits of e-Government” [A1, Manager]

“Connections (Wasta) in our society have a hidden force. Even though, we have resources to reap the full advantages of e-Government Wasta plays a major role in hindering e-Government initiatives” [A3, Manager]

“Lack of expertise sometimes leads citizens to not access services when they need them. Lack of in-house technical expertise can potentially create difficulties and lead to costly solutions. Staff resistance to changes can also pose a significant threat to our e-Government projects” [A3, Manager]

Cultural and social influences were seen by many of the interviewees as significant stimulus, which may have varied positive or negative effects on e-Government adoption. Some of the interviewee stated that they started using e-Government services because they saw their colleges using them. In contrast, other interviewee noted that they don’t have the expertise to use the e-Government services and they have not been encouraged to use or helped on how to use these services.

5. Discussion

The qualitative analysis revealed differences among information sharing participants in regard to the most important characteristics of sound information. In general, many of the interviewees found that concise and consistent representations are very important attributes of sound information. The qualitative analysis provided some insights on why sound information is an important enabler for e-Government strategic benefits. Based on this analysis, sound information is essential to provide timely and accurate information, which in turn leads to quick reaction to users’ needs. These findings are consistent with findings of Campbell et al., (2004) who found that accuracy can positively affect organization’s ability to respond quickly to customers’ needs. The analysis revealed agreement among different information participants on that security is the most important aspect of dependable information, which has influence on strategic benefits. There was also agreement among interviewees on that information security is essential prerequisite for enabling e-Government. This agrees with e-Government literature, where security and privacy have been cited frequently as a barrier to the development of e-Government (Lambrinoudakis et al., 2003; Al-Shihi and McGrath, 2006).
Not surprisingly, the qualitative analysis of dependability questions revealed a deeper insight into the characteristics of dependable information.

In terms of explanation for why information security influences strategic benefits, some of the interviewees correlated secure information with cost reduction. Other interviewees linked between lack of security and increase in customers' complaints. The qualitative analysis presented several results, where the majority of the interviewees identified value-added and ease of use as the most important characteristics of usable information. Similar to useful information, most of the interviewees have linked between usable information and enhancing communications with partners and citizens.

The qualitative analysis added completeness to list of the characteristics that affects institutional value. These characteristics are vital to credibility of organizations and to strengthen their professional image. This because incomplete information can delay or stop processing e-Government transactions, which in turn can cause mistrust over the public. This corresponds with the literature findings those points out that sound information exerts a greater influence on organizational image and credibility (Nguyen and Leblanc, 2001; Rana et al., 2012). Both timeliness and security have become a priority for organizations because they not only affect the quality of e-Government services but the whole institutional image as well. In recent years, a number of reports literature findings have highlighted the relation between dependable information and organizational credibility and image (e.g. Shih and Li, 2006; Al-Shihi, 2006). The analysis also uncovered very interesting insights into the relationships between dependable information and institutional value. In addition to enhancing organization credibility and image, dependable information is a key enabler for community commitment and active participation in e-Government services. Such findings concur with literature stressing the influence of dependable information on community commitment and loyalty (e.g. Jang et al., 2008). The qualitative analysis asserted that appropriate amount and relevancy are the most important characteristics of useful information that affects institutional value. Most of the interviews emphasized that relevance and appropriate amount of information make it easy to track and monitor e-Government services, which reflects directly on institutional value.

Findings also revealed differences among information sharing participants in regard to the most important characteristics of usable information. However, most of the interviewees have agreed that increase in e-Government services take-up is attainable through providing usable information. This is consistent with e-Government literature which identified information usability as a key barrier to the e-Government adoption (e.g. Ebrahim and Irani, 2005).

Results revealed some interesting insights that explained the differences among the perspective of the information sharing participants regarding the most important characteristics of information quality. Information users were more concerned about the attributes of information quality that can help them to complete their daily tasks and jobs; while employees with managerial responsibilities were more concerned about the attributes that provided strategic advantages to e-Government services. For example, users valued accessibility and ease of use over value added which was favoured by managers and provides.

Not surprisingly, the qualitative analysis added one of the excluded factors, which is introducing new and innovative e-Services. In addition, the qualitative analysis identified another three elements of strategic benefits. The three elements are (a) cost saving; (b) enhance decision-making process; and (c) improve citizen satisfaction. In the same line, previous studies has shown that there is a positive relationship between information quality and cost saving and this relationship, in turn, contribute to enhance organizational performance (Campbell et al., 2004; Kerr and Norris, 2004).

As expected, some interesting insights also emerged from the qualitative analysis concerning the relationships between strategic benefits and organizational performance. These insights are centred on the explanation of how the improvement in various aspects of the strategic benefits can lead to increase the organizational performance. Some of the interviewees noted that introducing new and innovative e-Services can improve organizational performance. In addition, many of the interviewees go beyond the link between information quality and strategic benefit to demonstrate the relationship between usable information and organizational
performance. For instance, interviewees stated that usable information can lead to an increase use of e-Government services.

Results confirmed the strong relationship between all institutional value elements, including active participation in all government tiers, and institutional performance. Improvement in institutional image and credibility can greatly increases organizational performance. This is because the organizations will reduce the need to devote their resources to establish their image and credibility and will make these resources available for more productive purposes. The qualitative analysis also explained further on the relationships between information quality and organization performance. Most of the interviewees have agreed on that information, which is highly regarded in terms of its source or content, is very crucial for the organization image and credibility.

Based on this analysis, cost saving, increase citizens’ satisfaction and enhance decision-making process were the most important benefits identified by the participants in this research. Cost saving is realized by utilizing organizational resources to improve their performance rather than to fix the problems of poor quality information. This finding clearly illustrates link between strategic benefits and institutional value because organizational image and credibility are the two most important attributes of institutional image.

The researchers believe that this link is a bidirectional relationship because both sides of the relationship have effects to the other side. For instance, quick reaction to users’ needs, an element of strategic benefits, can lead to improved organizational image and credibility, which in turn can create closer relationships with partners and citizens. Various studies have pointed out that quality information is important for cost saving and efficiency in e-Government operation (e.g. Bertot et al., 2013). Other studies reported cost saving as one of the key benefits of e-Government in general (e.g. Li and Feeney, 2014).

The qualitative analysis revealed that quality information can increase job satisfaction. Most of the interviewees stated that they are expecting quick and individual benefits from quality information. Some of the interviewees asserted that quality information empowered them and provided them with ability to exert more control over their job duties. As the focus in this research is on the perspective of different information sharing participants in e-Government, most of the interviewees’ views were concerned about the insider benefits of information quality. However, the main aim of this research is to investigate the net benefits of information quality, which obviously extended to cover information sharing participants and citizens as well. Having this in mind, citizen satisfaction was one of the new benefits of information quality which emerged through the qualitative analysis. Some of the interviewees not only linked between information quality and citizen satisfaction, but also they attribute increase e-Government use to citizens’ satisfaction. Gupta and Jana (2003) identified poor quality information as the major causes of citizen dissatisfaction.

Although most of the interviewees recognized the benefits of information quality, both at the individual and institutional level, they acknowledged some of the challenges and barriers which may limit the potential for positive outcomes of information quality. On the top of these challenges and barriers were cultural and social influences, lack of expertise and resistance to change.

Kuwait’s social organization is predominantly tribal in nature where tribal and religious norms govern relationships among people including business and work relationships. The tribal system in Kuwait affects the role of individuals, which is reflected in the operational ethos and values of an organization. Kuwaitis depend heavily on personal and family connections “Wasta” to get work done. Wasta defined by Loewe et al., (2007) as the act of asking for or benefiting from preferential treatment instead of going through official channels. Nepotism is another word for Wasta and can be defined as favoritism granted to relatives or friends regardless of merit. A good example of Wasta acts is the intervention on an individual’s behalf to obtain a government services or documents. Majority of participants in that study (86%) expressed that they would use e-Government services if the importance of connections or “Wasta” was likely to be decreased in Kuwaiti society. The same participants claimed that Wasta acts contribute to maintain corruption in society and increases inequality between individuals. Many of the interviewees claimed that Wasta is negatively affecting their performance. For example, some of the interviewees noted that sometimes they forced to process transactions with missing information because of Wasta. Some of the interviewees have a strong believe that Wasta can lead to process orders, even in spite of poor quality or incomplete information.
It is very common to see gaps and variation in the level of information technology readiness amongst e-Government organizations. The variation also can be seen in the level of expertise and human resources. This variation presents significant challenges to maximize the potential benefits of information quality. In addition, weakness of one of e-Governmental partner involved in providing information can eventually influence other e-Government partners. Lack of experience adds an extra burden and causes a range of problems including poor quality services and low performance, which represents a significant reputational risk to the institutional image. Some of the interviewees revealed that they experienced major delays because they do not have in-house technical expertise to fix some of information quality problems. Other interviewees with managerial responsibilities noted that lack of experience and awareness of information security breaches can lead to damage the institutional image, citizen dissatisfaction and other major problems. They firmly assured that it is everyone responsibility to promote information security awareness in order to minimize information security problems.

Organizational changes are inevitable processes of any organization. However, some of the employees find them easy to deal with. In fact, some employees show some resistance to these processes, which can have some negative consequences on organizations. These consequences can be widespread and may affect moral maturity and ethical attitude of the whole organizational workforce. In addition, when employees resist changes taking place in an organization, they may feel insecure and pessimistic about their professional future with the organization. This can lead them to become less focused on doing their daily jobs and spend more time on resisting these changes. Moreover, resistance to changes can create a disruptive work environment where clashes between employees and management team are highly expected.

These findings are partially consistent with existing literature on challenges for e-Government initiatives (e.g. Ho, 2002; Gil-Garcia et al., 2007). The main difference between this research and the mainstream literature is that this research focuses on the relationship between information quality and organizational benefits and performance in the context of e-Government, while the existing research studies investigate the relationship between e-Government initiatives in general and organizational benefits. However, this research is consistent with the mainstream literature in that resistance to changes has negative effects on organizational performance.

6. Conclusion

The study findings were reported from a 31 interviews investigated factors that may influence or hinder for enabling e-Government strategic benefits in Kuwait. Three e-Government agencies were selected to conduct semi-structured interviews namely, Ministry of Justice, Ministry of Finance and Public Authority for Civil Communication. On a practical level, the recommendations provided by this study may be useful to Kuwaiti e-Government and perhaps other countries’ e-Government that are seeking ways for enabling e-Government services. Several themes (i.e. information quality, strategic benefits, and institutional values) were observed to achieve better e-Government Benefits. Specifically, for information quality theme, accuracy and completeness for the sub-theme of sound information; objectivity, interpretability, and relevancy for useful information; security and timeliness for dependable information; and believability, accessibility, and value added for usable information. In addition, for strategic benefits theme, cost savings and time and efforts for the sub-theme of costs; agility and efficiency, and empowerment for decision making; new and innovative e-services for service quality. Furthermore, for institutional values theme, responsibility for the sub-theme of institutional image; while transparency, and accountability for credibility. The research also uncover some new drivers (Cost saving and customer satisfaction) and barriers (e.g. Nepotism and Wasta) to improving organizational performance. In addition, the results can help in facilitating the development and planning of e-Government projects by defining information quality requirements.

There are some limitations in the data collected for this research. These data is collected from three governmental agencies in Kuwait. Those agencies have a relatively similar profile in terms of the portfolio of the e-Government services they offer. Therefore, the sample of the data collected is not representative of the entire Kuwaiti population and thus may introduce some bias to the results of this study. In addition, and as this study confined to Kuwait, the findings of this research cannot be generalized to other countries because each country has unique characteristics, needs and capabilities. Specifically, this research encountered some difficulties and limitations. First, the collecting data process presents some challenges. Only few participants were motivated to participate in the research interviews. Participants of this study were government
employees who are usually overworked and busy with their daily tasks. Also, access to the participants with top management responsibilities was not an easy task. In addition, another challenge was related to culture issues. For example, some female participants were uncomfortable to be with a male in the same room beyond close doors. To overcome these challenges, the author put extra time and effort to make arrangement to conduct interviews with as many participants as possible. Second, the analysis process presents also some challenges. The collected data from the interview was in Arabic language and translation of this data into English language was a challenging task and prone to errors. To overcome this challenge, the author followed Brislin’ back-translation method (Brislin, 1980) by translate data back and forth between Arabic and English and with help of several bilingual experts. This process continues until the Arabic and English answers were converged. Another challenge related to the analysis process is the large amount of codes emerged from the data analysis. This forced the author to revisit the codes and refine the codes as much as possible, which results, in turn, into more high-level themes and categories. Third, although this study provides a valuable and reliable research model to explore information quality drivers and barriers to improving organization performance, this model, nor the recommendations and findings of in this study can constitute a guarantee for improving government performance. E-Government projects are complex, encompassing, cultural, political, organizational and technical aspects. Information quality aspects are not the only factors that affect the success of e-Government projects. Therefore, policymakers and stakeholders should consider all relevant factors that may contribute to the improvement of the performance of e-Government organizations.

Future research should employ new tools to collect data such as focus group and web logs. Focus group can provide insights into participant’s shared understandings, while web logs can provide a great deal of insight into user interactions with e-Government services. Using these new methods to collect data required employing new data analysis tools and techniques such as data mining, text analytics and sentimental analytics. Other possible areas for future research are developing and applying new methods and Key Performance Indicators (KPI) to measure organization performance. Web logs can offer a treasure trove of data including, but not limited to, location data, traffic data, conversion data, and behavioural data. The analysis of these data can provide more accurate and actionable metrics and KPIs. Future research also might incorporate citizens’ perspectives and views in regard to the relationships between information quality and organization performance.

References


Which Factors Can Affect e-Public Procurement Adoption by Private Firms? The Case of Belgium

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Abstract: Firms are the main users of e-public procurement applications (hereinafter e-procurement), so their acceptance to adopt this technology is a crucial element in its successful implementation. Nonetheless, very few studies have focused on this subject. This article aims to identify and analyse the factors affecting private companies’ adoption of e-procurement. Relying on several solid theories in the field of acceptance and adoption of innovation, namely the Technology Acceptance Model (TAM), the Diffusion of Innovation theory (DOI), the Technology, Organization, Environment framework (TOE) and the Iacovou et al. model, we constructed a research model that included the most important potential factors that can influence this variable. Our model was tested according to the survey method. Based on the data received from 760 Belgian firms spread over a wide range of economic activities, we identified five main variables that could explain about 33.5 % of the total variability of e-procurement adoption by firms: size, attitude towards change, competitive pressure, trading partners’ pressure and organizational readiness. In contrast, we did not find any significant relationship between the relative advantages and e-procurement adoption. Finally, the implications for theory and practice are discussed.

Keywords: Technology Acceptance, e-procurement, survey, private firms, Belgium.

1. Introduction

Public procurement refers essentially to the process by which public authorities, such as government departments, local authorities and certain public utility operators, purchase work, goods or services from firms. Consequently, public procurement is a reciprocal relationship governed by law between public authorities and companies. This process, which takes many forms depending on the value and nature of the public contract, is traditionally conducted using the conventional paper method. In the 1980s, with the development of electronic data interchange (EDI), initiatives to digitize the procurement process began, particularly in the private sector. In 2004, European countries adopted an action plan for the implementation of the legal framework for electronic public procurement. The ministerial declaration that was unanimously approved on 24 November 2005 in Manchester by the European ministers in charge of e-government stated that:

“By 2010 all public administrations across Europe will have the capability of carrying out 100% of their procurement electronically … and at least 50% of public procurement above the EU public procurement threshold will be carried out electronically”. (UK presidency of the UE, 2005)

In response, Belgium helped to introduce an e-procurement system. Belgium is a federal state comprising three regions: Flemish Region (The official language is Dutch), Walloon Region (The official languages is French) and Brussels-Capital Region (Its official languages are both Dutch and French). Since 2005, the Federal Public Service Personnel and Organization (FPS P&O) has developed and supported many e-procurement applications that enable public buyers and companies to digitize public procurement procedures. E-notification (the application which allows public buyers to publish public procurements and to companies to consult them electronically) became mandatory for all contracting authorities in January 2011. Since 1 January 2013, all federal authorities have also been obliged to accept electronic tenders. E-submission (the application by which contracting authorities can electronically open tenders/requests for participation, electronically generate the report of opening and make it available. Companies can electronically submit their tenders/requests to participate and digitally sign them) is already mandatory in Flanders. These efforts have led in recent years to a significant increase in e-procurement use. Belgium is still lagging behind, however, both as regards its own objectives and at the European level. According to a study conducted by the International Data Corporation (IDC) in 2013, Belgium was ranked in 11th place in Europe in terms of intensity of e-procurement use (International Data Corporation, 2013).
In fact, very little is known about firms’ acceptance to adopt e-procurement in Belgium. According to the Organisation for Economic Co-operation and Development (OECD), the percentage of Belgian companies that use e-procurement systems to offer goods or services to public authorities is still very low (see Figure 1). This study aims to highlight the acceptance to adopt e-procurement by firms in Belgium. This does, however, raise an important question: why do we care about the acceptance to adopt e-procurement systems when their use will become mandatory for both public authorities and firms?

Several studies have shown that, in mandated situations, users who do not wholeheartedly accept the innovation can delay or obstruct its implementation by underutilizing or sabotaging the new system. These reactions result from the positive or negative attitudes that users form toward this system (Brown et al., 2002). Thus, understanding the acceptance of the innovation in mandatory use settings is mainly related to the need to minimize sabotage and unfaithful appropriation of technology, and the resulting costs associated with such behaviour.

After addressing the theoretical context of innovation acceptance in the literature, we will attempt to examine and discuss the factors affecting e-procurement acceptance by firms. To address these objectives, a quantitative study, including an online survey, was performed.

Figure 1: Businesses using electronic procurement systems, 2013. Source: OECD (2015)

2. Theoretical basis

A literature survey enables us to find several theories associated with the adoption of technology.

The Diffusion of Innovation theory (DOI) proposed by Everett Rogers in 1962 is a fundamental approach to investigations of how a new technology diffuses (Hsu et al, 2006). This theory provides a conceptual and analytical framework for describing the acceptability of innovation and explains its evolution from the invention stage to extended use. For Rogers (1995), the adoption rate of innovation is “the relative speed with which an innovation is adopted by members of a social system”. This rate is influenced firstly by the perceived attributes of the innovation, which include its relative benefits, compatibility, complexity, observability and testability. According to Rogers, these five attributes can explain 49-87 % of the variance in the rate of adoption. Secondly, the adoption rate is influenced by the characteristics of the organisation itself, like as centralisation, formalisation, size, slack and interconnectedness. Although Rogers’s theory seems to be quite applicable to an investigation of innovation adoption, many researchers continue to search other contexts which can influence this subject. In 1990, Tornatzky and Fleischer developed the Technology, Organization, Environment framework (TOE) to analyse and measure the adoption of technology at the organisational level (Tornatzky & Fleischer, 1990).

According to the authors, the process by which an organisation adopts and implements technological innovations is influenced by three contexts: the technological context, the organisational context and the environmental context. These three elements represent “both constraints and opportunities for technological innovation” (Tornatzky & Fleischer, 1990). The first two contexts within TOE are similar to the two categories of variables proposed in the DOI theory. However, TOE adds another very important dimension: the environmental context – which refers to the environment in which the organisation operates. It can include
many variables, such as the company’s competitors, its relations with the government, but also the regulatory environment. The TOE framework makes the DOI better able to explain innovation diffusion at the organisational level (Hsu et al, 2006). Over time, however, inter-organisational systems, such as e-commerce, B2B and Electronic Data Interchange (EDI), turn out to be significant instruments in the business world. DOI and TOE may not be able to cover all the characteristics of the new factors which can influence a firm’s adoption of technology. Iacovou, Benbasat and Dexter (1995) developed a new model to explain the adoption of EDI in small firms. Their model comprises three components:

- Perceived benefits, which had appeared as the technology context in the previous models and
- Organisational readiness, which is similar to the organisation context in the previous models
- External pressure: since e-procurement is a network interorganizational system, external pressure can play a critical role in its adoption and use by firms. External pressure refers to influences from the organizational environment. The two main sources of external pressure to adopt are competitive pressure, and more importantly, imposition by trading partners (iacovou et al, 1995)

While these three models try to capture the factors which can influence innovation adoption at the organisational level, the Technology Acceptance Model (TAM) proposed by Davis (1989) focus on the user level. According to Davis (1989), the acceptance of a particular computer system can be explained by the user’s motivation, which is in turn influenced by external factors, including the characteristics of this system. Three main factors can explain the user’s motivation: perceived usefulness; perceived ease of use and attitude towards using the system.

Perceived usefulness and perceived ease of use are influenced by external variables, including system characteristics. While attitude is the most important determinant of use, it is influenced by perceived usefulness and perceived ease of use.

These four models have been widely studied and accepted as valid models in predicting acceptance behaviour across various information technologies and their users (see Table 1).

Our research combines features of all these four models to derive an integrated framework for e-procurement adoption at the organizational and individual levels (see figure 2).

### Table 1: Practical support of models used in the research

<table>
<thead>
<tr>
<th>Theory /Model</th>
<th>Some practical studies which used this theory/Model</th>
<th>Type of innovation/technology</th>
</tr>
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<tbody>
<tr>
<td>TEO</td>
<td>Zhu et al., (2003); Angeles, 2014 ; Pan &amp; Jang, (2008); Lippert &amp; Govindaraju, (2006); Oliveira &amp; Martins,(2010); Hsu et al, (2006)</td>
<td>E-Business adoption by European firms; Nike’s “Considered Index” Green Initiative; the adoption of enterprise resource planning; Web Services Adoption; e-business adoption; ; E-Business Use in U.S. Firms</td>
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### 3. Research model and hypotheses

Our research model primarily aims to identify and explain the factors affecting companies’ acceptance to adopt e-procurement. It combines features of all four previous models to establish an integrated framework. With regards to our independent variables, the first thing we attempted to do, starting from the literature, was to identify the most important factors that may influence e-procurement adoption by firms.
Our second step was to discuss these theoretical findings with many Belgian experts in fields of public procurement, e-procurement and information technology. These exploratory interviews were conducted between March and June 2015 with seven experts who already work in professions related to the implementation of e-procurement in Belgium, such as Federal Public Service Personnel & Organization; Information and Communication Technology Federal Public Service; the Economic Development Agency of the Province of Liège (SPI); the Belgian Buildings Agency and PwC Belgium. We were subsequently able to identify six potential variables that may affect e-procurement adoption by firms. The first one is the attitude towards using e-procurement as highlighted in the TAM. This construct tries to examine the acceptance of e-procurement at the user level. The second and third are environmental constructs from Iacovou et al. (1995) framework. The fourth, fifth and sixth are organizational constructs which have been consistently used in TOE, DOI and Iacovou et al (1995).

3.1 Attitude towards use (AT)

This variable has appeared in several previous theories, such as the Reasoned Action Theory proposed by Fishbein & Ajzen (1975), which was a key theoretical basis for the initial development of TAM. Attitude was defined by Fishbein & Ajzen (1975) as the “individual's positive or negative feelings about performing the target behaviour”. So, in our case, attitude represents the positive or negative stance of a firm's employees to use e-procurement. The importance of attitude as a determinant of a system's use is supported by many practical studies like Melone (1990); Koh et al. (2010); Kamarulzaman et al., (2013), thus, we decided to include attitude in our model in order to test its influence on e-procurement adoption by firms. Our first hypothesis can be stated as follows:

H1: Employees’ attitude towards using e-procurement positively influences the adoption of e-procurement by companies.

3.2 Competitive pressure (CP)

The effect of competitive pressure on the adoption and use of innovation has received a lot of attention in the literature. However, the results regarding its impact remain contradictory. A study by Premkumar and Roberts (1999), conducted in the field of e-commerce, claimed that there is a positive relationship between competitive pressure and the adoption of new information technologies in rural small businesses. This relationship was also emphasized by Iacovou et al. (1995) in the field of adoption of EDI in small businesses. In contrast, Thong (1999) found that competitive pressure has very little influence on the adoption of e-commerce by small businesses. Since many studies claim the existence of a positive influence of competitive pressure on the adoption of innovation, we decided to include this factor in our research model to test its influence on the adoption of e-procurement by companies. Our second hypothesis is therefore:

H2: Competitive pressure has a direct positive impact on the adoption of e-procurement by companies.

3.3 Trading partners’ pressure (TPP)

Trading partners’ pressure was highlighted by Iacovou et al. (1995) as a major factor that can affect the adoption and use of technology by small businesses because the weaker partners in interorganizational relationships, especially small businesses, are extremely susceptible to coercion by their larger partners (Iacovou et al., 1995). From a practical standpoint, this relationship is supported by several studies, e.g. Hart and Saunders (1998), who found a significant relationship between pressure exerted by business partners and use of EDI. In addition, Hsu et al. (2006) reported the influence of this factor on the diversity of the use of e-commerce by businesses in the United States. In our case, we equate trading partners with public buyers. For the purposes of this study, public buyers refer to all contracting authorities and public enterprises subject to the legislation on public procurement in accordance with the Belgian Law of 15 June 2006. We can now state our third hypothesis as follows:

H3: Pressure from public buyers will have a positive impact on the adoption of e-procurement by companies.

3.4 Organizational readiness (OR)

Iacovou et al. (1995) defined organizational readiness as the availability of financial and technical resources in the organization. According to these authors, this factor is one of the three main determinants that influence the adoption of EDI by small businesses. They explained this by the low level of IT sophistication and lack of
resources among SMEs. Several other empirical studies have also found a correlation between organizational readiness and adoption of innovation by the organization (Zhu & Kraemer, 2002; Kalianna et al., 2009).

Following our seven interviews and for the purposes of this study, organizational readiness will be based on three main elements: senior management support, the availability of adequate financial and technical resources and the availability of necessary computer knowledge to adopt and use e-procurement (through employee training). So we can formulate hypothesis 4 as follows:

H4: Organizational readiness positively influences the adoption of e-procurement by companies.

3.5 Perceived Relative advantages (RA)

The Diffusion of Innovation theory and the Iacovuo et al. (1995) model noted that the perceived benefit is a major determinant of the adoption of innovation. Several previous studies have claimed this relationship, including Hsu et al. (2006) in the field of e-commerce in the United States; Gunasekaran & Ngai (2008) in the field of e-procurement in Hong Kong; Musawa and Wahab (2012) in the field of EDI in Nigeria. However, other empirical studies have not found such a relationship between the relative advantages and the use of technology (for example, Huy et al. (2012) in the field of e-commerce in Vietnam). Given that there are many good advantages which may influence positively the adoption level of e-procurement by companies (e.g.: improved access to the government market; lower transaction costs; shorter procurement cycle; Communication anywhere/anytime etc.), we put forward our fifth hypothesis as follows:

H5: Perceived Relative advantages have a direct positive influence on the adoption of e-procurement by companies.

3.6 Size

An organization’s size, often measured in terms of number of employees, was frequently considered by the literature as an important determinant of technology adoption and use. A lot of empirical studies confirm the significant impact of this variable on adoption and use of technological innovations by organizations (Grover, 1993; Jeyaraj et al., (2006); Hsu et al., (2006); Batenburg, (2007); Abu-elsamen et al, (2010)). These results can be justified by the fact that large organizations are better able to pay for installation and integration costs, employee training and maintenance costs than SMEs. This is why we decided to include size in our research model in order to test its influence on the adoption of e-procurement by enterprises. The sixth hypothesis can be stated as follows:

H6: A firm’s size is positively related to its adoption of e-procurement.

Consequently, our research model is shown in Figure 2.

Figure 2: The research model
4. Research methodology

The survey method selected involved an electronically distributed questionnaire. The first two questions were designed to determine company size and sector.

With regards to our measurement scales, few studies have addressed the issue of e-procurement (e.g. Rahim, (2008); Kaliannan et al, (2009); Aboelmaged, (2010); Kamaruzaman et al., 2013); this is why the direct use of items from the literature was not always possible in our case. Many items were therefore developed specifically for this study (see Table 1). All participating firms were asked to evaluate their level of agreement or disagreement with every item using a scale of 1 to 7 points as follows: 1 = strongly disagree, 4 = neuter, 7 = strongly agree.

Table 2: Potential determinants of e-procurement acceptance by firms

<table>
<thead>
<tr>
<th>Determinant</th>
<th>Definition used</th>
<th>Measurement scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative advantages (RA)</td>
<td>The degree to which using e-procurement is perceived as being better than the idea it supersedes (Rogers, 1995)</td>
<td>Three items were operationalised from Koh et al. (2010).</td>
</tr>
<tr>
<td>Competitive pressure (CP)</td>
<td>The degree to which the lack of use of e-procurement is perceived as a competitive disadvantage among firms (Iacovou et al., 1995)</td>
<td>Two items about possible competitive disadvantage due to the lack of e-procurement capability (Iacovou et al., 1995).</td>
</tr>
<tr>
<td>Attitude (AT)</td>
<td>Employees’ positive or negative feelings about using e-procurement (from Fishbein &amp; Ajzen (1975))</td>
<td>Three items operationalised from Koh et al. (2010).</td>
</tr>
<tr>
<td>Organizational readiness (OR)</td>
<td>Refers to the level of management support, availability of resources, and knowledge to adopt and use e-procurement.</td>
<td>One item operationalised from Iacovou et al. (1995) – three self-developed items</td>
</tr>
<tr>
<td>Trading partners’ pressure (TPP)</td>
<td>Refers to the pressure exerted by public buyers on firms to adopt e-procurement.</td>
<td>Three self-developed items</td>
</tr>
<tr>
<td>Size</td>
<td>All participating firms were requested to determine their size according to the number of their employees as follows:</td>
<td>According to the European Commission Recommendation (96/280/EC) of 3 April 1996 concerning the definition of small and medium-sized enterprises (number of employees only)</td>
</tr>
<tr>
<td></td>
<td>• Micro-enterprise: fewer than 10 employees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Small enterprise: between 10 and 49 employees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Medium-sized enterprise: between 50 and 250 employees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Large enterprise: more than 250 employees</td>
<td></td>
</tr>
</tbody>
</table>

With regards to our dependent variable, i.e. firms’ adoption of e-procurement, we used a scale of 1 to 5 as follows: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often and 5 = Always. All participating firms were asked to evaluate the frequency with which they use e-procurement applications available in Belgium when this use is voluntary, i.e. when they have the choice between using e-procurement or the classical method of procurement. In this manner, we can estimate their level of acceptance for adopting e-procurement.

In order to take language differences between Flemish and Walloon regions in Belgium into account, we prepared two versions of our questionnaire, one in French and the other in Dutch. Sample size was calculated using Cohen’s (1988) formula, taking into consideration the number of independent variables used in the analysis, the specified power of .80, an effect size of .02, and a significant alpha of .05. Desirable sample size was then determined for about 684 participants. In order to estimate the response rate, we used information from previous surveys on a similar population conducted by SPI (the Economic Development Agency of the Province of Liège (SPI) and Fedict (Information and Communication Technology Federal Public Service). On this
basis, we determined the expected response rate between 10% and 20%. Thus, in November 2015, our questionnaire was sent by e-mail – using the database of the FPS Personnel & Organisation, which is the organisation responsible for the implementation and development of e-procurement applications at the Federal level in Belgium— to a random sample of 5,000 Belgian firms.

5. The results

A total of 760 Belgian companies of all sizes and spread over most economic sectors responded to our survey, which represents a response rate of 15.2%. Figure 3 shows the classification of respondents according to their size. We can see that the majority of the participating firms are micro-enterprises (about 40%), followed by small enterprises (28%), and then medium-sized and large enterprises (about 16% each). So, in general, we have good representative data for all company sizes.

Regarding sectors, we can see that the participating firms are spread over the main economic sectors in Belgium (see Figure 4). All received data were analysed using SPSS version 22.

Figure 3: Participating firms according to size

5.1 Data analyses

To test the hypotheses empirically, a multiple linear regression analysis was performed. As a predictive analysis, multiple linear regression is used to describe and to explain the relationship between one dependent variable and two or more independent variables. This analysis also used to identify the strength of the effect that the independent variables have on the dependent variable, to forecast effects or impacts of changes and to predict trends and future values.

Before conducting the multiple linear regression, we took several steps to check for possible violations of the assumptions underlying this analysis:
A test of linearity was performed. Based on the ANOVA table value sig. Deviation from linearity was 0.09 for each of the independent variables. Thus, it can be concluded that there is a linear relationship between the dependent variable and the independent variables. Multicollinearity was tested using a correlation matrix which showed that the correlation coefficients among all independent variables were smaller than 0.7, which means that no multicollinearity between independent variables. With respect to normality, the Shapiro-Welk test was performed. Results showed that this test was not statistically significant (Sig > 0.05). So, we can accept the null hypothesis and conclude that the dependent variable is normally distributed.

Principal components factorial analysis with Varimax rotation was performed in order to analyse the quality of measurements. According to Nunnally (1978), the values of the dimensions must be greater than or equal to 0.50. The results shown in Table 3 confirmed the existence of five factors with eigenvalues greater than 1. One item only was eliminated from the analysis because it did not load on any of the five factors, namely organizational readiness OR1 (value < 0.50 – see Table 3). These results therefore confirm that each of our constructs is unidimensional and factorially distinct. Cronbach’s alpha coefficient was calculated in order to ensure the reliability of our items. The results show that all our scales exceeded the recommended threshold of 0.70 (Premkumar, 2003), which suggests good reliability of the measurements selected (see Table 4).

Table 3: Factorial analysis with Varimax rotation

<table>
<thead>
<tr>
<th>Items</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>OR1</td>
<td>.476</td>
</tr>
<tr>
<td>OR2</td>
<td></td>
</tr>
<tr>
<td>OR3</td>
<td></td>
</tr>
<tr>
<td>OR4</td>
<td></td>
</tr>
<tr>
<td>RA1</td>
<td></td>
</tr>
<tr>
<td>RA2</td>
<td></td>
</tr>
<tr>
<td>RA3</td>
<td></td>
</tr>
<tr>
<td>TPP1</td>
<td></td>
</tr>
<tr>
<td>TPP2</td>
<td></td>
</tr>
<tr>
<td>TPP3</td>
<td></td>
</tr>
<tr>
<td>CP1</td>
<td></td>
</tr>
<tr>
<td>CP2</td>
<td></td>
</tr>
<tr>
<td>AT1</td>
<td></td>
</tr>
<tr>
<td>AT2</td>
<td></td>
</tr>
<tr>
<td>AT3</td>
<td></td>
</tr>
<tr>
<td>Eigenvalues</td>
<td>10.934</td>
</tr>
<tr>
<td>% variance</td>
<td>37.540</td>
</tr>
</tbody>
</table>
Table 4: Cronbach Alpha analysis

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. of items</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational Readiness (OR)</td>
<td>3</td>
<td>.795</td>
</tr>
<tr>
<td>Attitude (AT)</td>
<td>3</td>
<td>.870</td>
</tr>
<tr>
<td>Relative advantages (RA)</td>
<td>3</td>
<td>.839</td>
</tr>
<tr>
<td>Competitive Pressure (CP)</td>
<td>2</td>
<td>.791</td>
</tr>
<tr>
<td>Trading Partners Pressure (TPP)</td>
<td>3</td>
<td>.765</td>
</tr>
</tbody>
</table>

A multiple linear regression analysis was then performed. As shown in Tables 4 and 5, according to R-squared = .335, our research model was able to explain about 33.5% of the total variance of e-procurement adoption by firms. Five factors have a significant impact on the adoption of an e-procurement system. In decreasing order of importance, these are: attitude towards change, organizational readiness, trading partners’ pressure, size and competitive pressure. We can therefore validate our hypotheses H1, H2, H3, H4 and H6. In contrast, we found that Relative Advantages does not have any significant impact on e-procurement adoption by firms (p-value = .094). Our fifth hypothesis H5 is therefore rejected (see Table 5).

Table 5: Model summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R- squared</th>
<th>Adjusted R- squared</th>
<th>Std. error of the estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.579*</td>
<td>.335</td>
<td>.329</td>
<td>.69274</td>
</tr>
</tbody>
</table>

Table 6: Regression analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>.638</td>
<td>.137</td>
<td></td>
<td>4.666</td>
</tr>
<tr>
<td>Size</td>
<td>.071</td>
<td>.025</td>
<td>.092</td>
<td>2.803</td>
</tr>
<tr>
<td>OR</td>
<td>.098</td>
<td>.025</td>
<td>.159</td>
<td>3.877</td>
</tr>
<tr>
<td>RA</td>
<td>.053</td>
<td>.031</td>
<td>.084</td>
<td>1.675</td>
</tr>
<tr>
<td>TPP</td>
<td>.093</td>
<td>.026</td>
<td>.146</td>
<td>3.537</td>
</tr>
<tr>
<td>CP</td>
<td>.060</td>
<td>.021</td>
<td>.105</td>
<td>2.829</td>
</tr>
<tr>
<td>AT</td>
<td>.131</td>
<td>.027</td>
<td>.239</td>
<td>4.942</td>
</tr>
</tbody>
</table>

Dependent variable: e-procurement adoption by firms. F=52.724, Sig F=.000

6. Discussion of results

The results of our study have shown that five out of the six independent variables proposed in our research model were able to explain about 33.5% of the total variance of e-procurement adoption by companies. In descending order of importance, these are:

- **Attitude towards change** is the most important determinant of use ($\beta = .239$/p-value < .001). Our study therefore confirms TAM and several previous studies that reported a significant influence of attitude on the acceptance of technology (Koh et al. (2010); Brown et al. (2002)).
- **Organizational readiness** in turn showed a direct positive impact on the adoption of e-procurement by companies ($\beta = .159$/p-value < .001). The importance of this relationship has already been mentioned in several studies, such as Iacovou et al. (1995) in the field of EDI use by small
businesses, and Hsu et al. (2006) in the field of e-commerce in the United States. Given that organizational readiness refers essentially to the availability of necessary resources and knowledge to adopt e-procurement, this impact seems to be logical, especially for SMEs because of their limited resources.

- **Trading partners’ pressure** is the third in order of importance amongst our explanatory variables \( (\beta = .146/p\text{-value} < .001) \). As mentioned above, trading partners in this case represent the public buyers. Under paragraph 2 of Article 52 of the Royal Decree of 15 July 2011, the contracting authority may decide for each individual contract whether it requires, allows or prohibits the use of electronic means for the submission of tenders. The contracting authority shall mention this decision in the contract documents. In the absence of any stated decision in this regard, the use of e-procurement is prohibited. We can therefore estimate what role public buyers can play in motivating and encouraging companies to adopt and use electronic channels.

- **Regarding competitive pressure**, while some studies have shown a positive influence between competitive pressure and innovation adoption (Iacovou et al., 1995), others have found the opposite (Hsu et al., 2006). This can be partly explained by the difficulty, if not impossibility, of finding an accurate measure of competition in the market because of the variety of determinants that may influence this factor. Our study, however, maintained the existence of a positive and significant direct influence of CP on the adoption of e-procurement by firms \( (\beta = .105/p\text{-value} < .005) \). Given that the adoption of e-procurement can help firms to have more flexible and transparent access to public procurement, it seems logical to find competitive pressure as a determinant of e-procurement adoption by firms, especially SMEs.

- **Regarding company size**, our findings confirm the positive relationship between this factor and e-procurement use \( (\beta = .092/p\text{-value} < .005) \). Thus, our study endorses the majority of prior studies, which mentioned a significant positive impact of the company’s size on its acceptance of technology (e.g. Huy et al. (2012) in the field of e-commerce for SMEs in Vietnam, and Hsu et al. (2006) in the field of e-business in the USA). Our findings regarding this factor appear to be logical because the larger the company, the greater its ability to pay for installation and integration costs, employee training and maintenance costs. Usually, larger companies have the available resources to be better equipped and adopt innovations (Batenburg, 2007).

- **Regarding relative advantages**, no significant impact was found in our case. Our study therefore goes against several previous studies, such as Hsu et al. (2006), who found a significant influence of RA on adopting e-commerce in the United States. However, our results are similar to those of other empirical studies, which did not find a significant impact of RA on the adoption of innovation, such as the study by Huy et al. (2012) in the field of e-commerce for SMEs in Vietnam. In our opinion, this result can be explained by the fact that companies are not yet sufficiently aware of the benefits expected from the adoption of e-procurement. According to our statistics, we find that about a quarter of businesses remained non-committal on our questions regarding this scale (they chose to answer our questions by selecting 4 on a scale of 7 which means: “neutral”). This shows the high degree of lack of information about the expected benefits of this project.

7. Conclusion and implications

The empirical results suggest that our research model can usefully explain the adoption of e-procurement by firms. Five of the proposed independent variables could explain about one-third of the total variance of this adoption. In descending order of importance, these are: attitude towards change, organizational readiness, trading partners’ pressure, competitive pressure and size. In contrast, we did not find any significant relationship between relative advantages and e-procurement adoption by firms. Decision-makers in Belgium can use these findings to develop a more effective plan to promote the adoption of e-procurement amongst enterprises. Such plan can considerably help to reap the maximum of benefits of this system.

Despite our research model being tested using data from Belgian firms, we used a general method that can usefully be applied in the context of other European countries.

Our method has two main limitations. Firstly, there are many other important factors in the literature that can influence technology adoption, however, for practical reasons – especially regarding the number of questions included in our questionnaire – we could not test their impact on e-procurement adoption by firms. Future research could therefore focus on these factors, such as organizational structure, system openness,
government regulations, etc. Secondly, the survey method does not allow questioning of respondents and is not possible to elicit information in respect of language, history, thoughts and feelings of participants. Qualitative research which can examine these problems is therefore recommended in the future.

References


Kamarulzaman N. H., Mukherjee A.


Appendix A

Scales of Constructs

Organizational Readiness

- We have the material resources to use the e-procurement system
- We have the human skills needed to use the e-procurement system
- We have received adequate training on how to use the applications of e-procurement
- The top management of our company is innovative and favorable towards the use of e-procurement.

Perceived relative advantages

- The use of e-procurement allows us to reduce costs in our operations
- The use of e-procurement can improve the image of our company
- The use of e-procurement can improve trade relations with the public sector

Trading partner’s pressure

- Public purchasers encourage us to use the e-procurement system
- Public purchasers bring us the help needed to use the e-procurement system
- We believe that public purchasers are favorable to the adoption of e-procurement.

Size

- Micro-enterprise: Fewer than 10 employed
- Small enterprise: between 10 and 49 employed
- Medium-sized enterprise: between 50 and 250 employed
- Large enterprise: more than 250 employed

Attitude

- Use e-procurement system instead of traditional procedures (paper) public procurement is a good idea
- Use of e-procurement makes the establishment of trade relations with the public sector more attractive and interesting
- The use of e-procurement corresponds to how we wish to work.

Competitive pressure

- We may miss many opportunities in the public sector to benefit of our competitors if we do not use e-procurement.
- Using e-procurement provides competitive business advantage

Adoption of e-procurement

Could you please evaluate the frequency with which you use e-procurement applications available in Belgium when this use is voluntary? (i.e. when you have the choice between using e-procurement or the classical method of procurement)
From Assumptions to Artifacts: Unfolding e-participation within Multi-level Governance

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Abstract: The role of technological innovation within the context of governance processes is often embraced with rhetorical enthusiasm and seen as a de facto enabler for democratic decision-making. Underpinning this enthusiasm is the leap of faith made from transparency to trust, from complexity to coherence. The belief that using new tools for e-participation can generate dramatic transformation in public sector redesign and result in societal benefits is heralded as a shift towards public innovation. It is precisely this belief that we examine in this paper. We start our investigation by providing a conceptualization of what e-participation means within the context of multi-level governance. By using a cross case comparison of two European research projects, we provide an empirical base upon which we can examine the process of e-participation and the implications of digital e-participation tools for various levels of governance and public accountability. Furthermore we provide an interdisciplinary contribution in understanding the gap between what technological innovation makes possible and the acceptance or openness on the part of decision makers to embrace citizen input within policy processes.

Keywords: Social Sensors, Open Governance, Crowdsourcing, e-participation, Trust

1. Introduction

Complexity is ever increasing with respect to the data becoming available to decision makers. Ranging from sensor data to text, from social media to expert repositories of knowledge, policy makers are grappling with how to make the journey from noise to signal. The challenge that emerges is how to make sense of and structure this vast body of data at their disposal, emerging as a by-product of various new forms of e-participation enabled by various Information and Communication Technologies (ICTs). Citizens and policy makers alike wrestle with how to intelligently filter information according to relevance, relationship and provenance. The endeavour at once becomes one of sense-making as well as trust-building. Within this context, decision makers are increasingly coming under pressure to be more inclusive and co-create policy with stakeholders, both from technologists as well as international and regional treaties such as the Aarhus Convention (1998). Situated in this transforming policy landscape, the role of e-participation has been met at times with rhetorical enthusiasm and at other times with critical concern (Barry & Bannister, 2014; Peled, A, 2014).

The idea of using new technologies and hence new forms of e-participation to support, augment or breathe life into democratic practices is not novel. Harrison & Falvey (2001) have argued that the introduction of ICTs routinely gives rise to intense speculation about their impact on the processes and practices of democracy. More specifically, there is the assumption that the Internet and its incumbent ecosystem of technologies may work to “amplify the political voice of ordinary citizens” [Hindman, 2008] in broad political processes. The shift that we observe here is therefore one away from the provision of information, documents and other one-way channels of communication to a multi-channeled dialogue and policy co-creation process.

While more collaborative and co-creating forms of public e-participation in administrative decision making are acknowledged to hold potential, there is also considerable evidence to suggest it is not always successful [King, 1998]. According to Fung [2006], participation in general varies according to three different dimensions: (1) who participates, (2) how participants exchange information and make decisions, (3) the link between public participation and decision making. Thus to simply suggest that more participation is always better is problematic in that different forms of participation (along the above dimensions) are more or less desirable depending on the characteristics of the policy process and the goals pursued.

Entering the landscape of e-participation, in some instances as incentive, in others as by-product are vast volumes of data. Boyd and Crawford [2012] see Big Data as a cultural, technological, and scholarly

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phenomenon that rests on the interplay of three factors: technology – where the trend is towards maximizing computational power and algorithmic accuracy to gather, analyze, link, and compare large data sets; analysis – drawing on large data sets to identify patterns in order to make economic, social, technical, and legal claims; and mythology – where they refer to the widespread belief that large data sets offer a higher form of intelligence and knowledge that can generate insights that were previously impossible and with an aura of truth, objectivity, and accuracy.

At present, there is a paucity of systematic research investigating the assumption that immediate and widespread disclosure of public data results in an accountable and transparent government. Our paper provides a critical analysis via two case studies, testing the utopian rhetoric accompanying the marriage of data with policy decision support.

In order to analyse how these new forms of e-participation influence decision-making within multi-level governance, in this paper, we examine the role of citizens as ‘social sensors’ in opening up traditional governance processes. We do so by drawing on insights from two large scale European initiatives that are built around policy modeling, simulation and decision support. The paper is structured as follows. Section 2 presents our conceptual framework, followed by the case study contexts and methodological details in Section 3. We analyse the results in Section 4 and the paper concludes with a discussion of whether e-participation involving citizens as sensors results in any meaningful transformations within government and what affords these new forms of e-participation bring.

2. Conceptual Framework

2.1 Conceptualising participation

The concept of participation in decision-making has evolved over a number of decades and is by no means a new concept. Based on a literature review of stakeholder (rather than broader public) e-participation in decision making, Reed (2008) argues that participation approaches have progressed through a series of phases: awareness raising in the 1960s, incorporation of local perspectives in the 1970s, recognition of local knowledge in the 1980s, e-participation as a norm as part of the sustainable development agenda of the 1990s, subsequent critiques and recently a 'post-participation' consensus regarding best practice. Consequently, there is a growing body of research focusing on the development of the widely recognized trend across policy structures suggesting that the status of traditional representative democratic processes and institutions is declining and new structures of governance are emerging (Bang, 2003).

Multi-level governance, which refers to the increasing interconnectedness of the various political arenas due to the processes of devolution, is of particular relevance to this discussion, as it offers elements precisely contributing to this complexity. Hajer (2009) talks about a change from the classical modernist governance into the modes of network governance, where people find themselves in new, ad hoc circumstances created by the current situation or a particular policy problem. Furthermore, there is the argument (Hajer & Wagenaar, 2003) that there are no pre-given rules that determine the responsibility, authority or accountability of complex processes. Recognising the importance of participatory practices then, in the network society, implies looking not only at what happens in formal participatory practices but also at what happens behind the scenes, in informal practices (Turnhout, et al., 2010). These informal practices are not necessarily organised in invited spaces, but are emerging spontaneously and are based on common concerns created by the particular situation at hand (Cornwall, 2002). This relates particularly to the use of social media when framing policy decisions or anticipating their impact.

2.2 From e-participation to Collaborative Planning

Some studies have suggested that trust in e-government can be built through increased responsiveness to user needs and inquiries and through increased transparency but such efforts are thus far limited (Gauld, et al., 2009). One of the advantages offered by transparency (be it in relation to data, process, or decisions), is that it leads to - and one can argue is even imperative for - trust. The relationship between transparency and trust has increased in importance in the modern discourse about democracy (Bannister et al., 2011). In particular, when the discourse turns to e-government and the opening up of data, the assumption that by opening up or releasing data, the governance process automatically becomes more transparent and hence engenders trust on the part of citizens, is at best a problematic one.
Via the lens of an experiment, Grimmelikhuijsen (2009) examines the extent to which web-enabled e-transparency influences trust of a government agency as conceptualized through the dimensions of competence, benevolence, and honesty. His results show that the relationship between e-transparency and trust dimensions was not unequivocal, and that while perceptions of benevolence and honesty are positively affected by the level of transparency, perceptions of competence may actually be lowered. Critically, the findings show that while e-transparency increases the level of knowledge about the government agency (which is to be expected), it does not automatically translate into a higher level of trust in a government agency. The value of this study lies in the fact that it provides for the first time empirical evidence that e-transparency may exert a heterogeneous or ambiguous effect on trust dimensions and, in contrast to the view of Bouckaert and Van de Walle (2003), that a high degree of e-transparency does decrease certain aspects of citizen trust in government agencies. Grimmelikhuijsen (2009) refers to the negative aspects of his findings as the dark side of transparency — which results from a demystification of both government processes and performance.

While demystification can act as a force weakening trust in government, the counter force to that is of legitimization. This is linked to the belief that opening up data and processes of governance to citizens will create greater trust in the process of public policy making. One form of ‘buy-in’ within this context could be generated via citizens acting as points of data collection (or in other words when citizens become social sensors), rather than being called in at the end of a policy decision in a more tokenistic sense to offer mere preference-elicitation. New forms of distributed e-participation here offers a unique opportunity where citizen observations and inputs can be brought into the decision making process at an early stage of agenda setting within public policy.

2.3 New forms of distributed e-participation: what are Social Sensors?

The term “Social Sensors” includes a multitude of concepts and hence needs clear definition before we proceed. The core idea of involving the public in data gathering is referred to as citizen science, people-centric sensing or participatory sensing by different scientific disciplines (Wehn and Evers, 2015). From a technical perspective, the term implies technologies such as physical sensors (stationary devices such as weather stations or mobile devices such as smart phones or dedicated sensor devices)), social media as well as software to make sense of, or parse large bodies of, open data. The latter comprise of a range of computational mechanisms (algorithms) that are used for semantic and sentiment analysis, linked open data, as well as policy simulation and modeling. From a social perspective, the term ‘social sensors’ refers to citizens (individuals and collective groups) who contribute information, explicitly or implicitly. In particular, we refer to a ‘social sensor’ role as one that relates to observations that are obtained in two ways: i) collected and mined from social media without citizens necessarily realising that their observation about a local situation is being included in a decision making process (labeled as ‘implicit data collection’) or ii) the intended and volunteered observations by citizens, collected using photos, videos, or sensor technology (‘explicit data collection’). Either way, at the conceptual level, acting as social sensors constitutes a distinctly new role for citizens, enabled by advances in, and the high diffusion of, mobile telephones as well as sensing technologies (Wehn et al., 2015). Policy makers and scientists now have a new data stream (i.e. data provided by citizens) to consider when researching a given policy problem, or modeling its impacts within society. Twitter in particular has been effective for early event spotting (Opsahl, 2010; Sakaki, et al., 2010). Such monitoring strategies are also being employed in epidemiology, where monitoring needs to be both distributed and longitudinal (for example in applications of e-health, where disease origin and evolution are mapped). In cases where there is need of continuous monitoring, social media can help measure the effectiveness of control measures and propaganda (Kavanaugh et al., 2012).

2.4 e-participation via crowdsourcing – opening up the governance process

Within the broader context of multi-level governance, crowdsourcing emerges as an explicit manifestation that can be used to increase e-participation. Crowdsourcing technologies make possible distributed and decentralised interaction (Donner J., 2010). This takes the form of outsourcing a given action in the form of a call to a community or to an undefined group of people, i.e. a crowd (Howe, 2006). What this enables is for citizens to share observations during events such as natural disasters, elections, community violence, etc., via online and mobile technology (e.g. SMS, voice, instant messages, Twitter, email) to a centralised server. Crowdsourcing in particular was made popular in development circles through the open source Ushahidi platform first used for post-election monitoring of violent acts in Kenya 2007-2008 (Hellström & Tröften, 2010).
Of particular interest to our research on the role of crowdsourcing as a form of e-participation within policy, is the assertion (Bott & Young, 2012) that "the core risks and challenges arise around the concept of trust". They warn that potential end-users may find such initiatives rigid or centrally controlled, or lacking any real incentives and hence would not see the benefit in participating (Bott & Young, 2012). Furthermore, there are also risks such as information overload caused by unverified data, inaccurate information, and threats to citizens' privacy and security when reporting (Currion P., 2010; Joyce M., 2010; Morozov E., 2011; Poblet M., 2011). Crowdsourcing thus has a range of anticipated and unanticipated knock-on effects that "need to be addressed to avoid the consequences of technological misuse and subsequent risks for citizens" (Poblet M., 2011, p.215). These risks associated with crowdsourcing are heightened when the crowd is asked to share personal information (e.g. on sensitive issues such as migration, wars, ethnic conflict or infections) that can be used to criticise the government, powerful industrial lobbies or public services.

Building on the above discussion, there emerges a niche of citizens within the broader crowdsourcing discourse, who add their voice, expertise and preferences via advanced ICT tools. Nevertheless, it has been argued that current initiatives are usually limited in three areas (Liu et al., 2014; Wehn et al., 2015). The first of these concerns one-way citizen e-participation, where the role of citizens is constrained to passive inputting of data, with little or no feedback. The second area refers to the lack of integration of citizen inputs with other infrastructure sensing data. Finally, the third area relates to the lack of personalised or real time spatio-temporal visualisation tools that would allow citizens to benefit from an augmented situation awareness. Lewenstein (2004) builds upon the above by pointing out two other definitions of the term which focus upon the governance aspects of public e-participation: the engagement of non-scientists in true decision-making about policy issues that have technical or scientific components, and the engagement of research scientists in the democratic and policy process.

To summarize what we have discussed so far is the changing face and role of e-participation within the discourse of governance. With regard to the remit of this paper, what is of particular significance is the opportunities opened up by these new forms of e-participation and via our case studies (introduced below) we will critically examine to what extent this changes the current status of multi-level governance.

3. Methodology

3.1 Case study method and rationale for selection

In order to gain comprehensive and in-depth understanding of the phenomenon under investigation, i.e. the role of new forms of e-participation within multi level governance, we selected two cases for a comparative study. These two cases addressed various levels of decision making (from the local to national to regional and even EU level) using new participatory methods and tools via which the traditional silos of governance and decision making were being challenged and opened up. We could map the results we derived from our extensive field work on to the theoretical frame of multi level governance and thus examine the impacts. The two empirical cases were selected precisely because they are demonstrators or showcases for new participatory tools (ranging from citizen science to policy modeling and simulation) that impact and change traditional notions of multi level governance. These cases complement each other in that they are approaching e-participation from the dual perspective of both citizens and policy makers. We selected them because of their unique use of ICT tools (sensors, semantic/sentiment analysis tools for social media data, policy simulation and modeling) and their intention to bring decision makers and citizens closer via the mechanism of e-participation.

3.2 A tale of two European initiatives

Both Sense4Us and WeSenseIt are two European Research initiatives (funded under EU Framework Program 7) that were conceived to assist policy makers and citizens to make more insightful and informed decisions. This was done via the design of tools that would take into account the views of citizens on policy issues in real time (via social media and linked open data) and help them to better understand the implications of proposed policies. The Sense4Us project emerges from the challenge that even once a policy is formulated, it remains difficult to make useful predictions about its likely impact and effectiveness. In addition, policy specialists may lack the resources and the methodology to be able to access the most current data and may not be in a position to take into account the views of citizens on policy issues expressed in real time through social network discussions. An articulated desire for the Sense4Us project was the advancement of policy modeling and simulation, data analytics and social network discussion dynamics, in the hope of providing economic and
social benefits to policy analysts at all governmental levels across Europe. To realise this goal, the project set out over three years (2013-2016) to develop tools that would enable the extraction of information from big and open data sources; the automatic annotation and linkage of homogeneous data; the lexical analysis of sources; the creation of policy models combining quantitative open data sources with qualitative data from social media; the likely impacts of a policy to be simulated, via understandable visualizations; and the tracking of discussion dynamics via social media.

A key aspect of the WeSenseIt project (2012-2016) was the direct involvement of user communities within the data collection process. The WeSenseIt project had the articulated desire to enable citizen involvement by collecting data via an innovative combination of easy-to-use sensors and monitoring technologies as well as harnessing citizens’ collective intelligence, i.e. the information, experience and knowledge embodied within individuals and communities communicated via social media (e.g. Twitter, Facebook, etc.) and dedicated mobile applications. These citizen observatories were intended to go beyond ‘mere’ sensing in order to harness environmental data and knowledge to effectively and efficiently manage water resources. The project aimed to define a framework in which authorities and citizens cooperate in: (i) sharing collective intelligence about events and places, (ii) supporting a shared situation awareness, not only to improve response and recovery, but also to improve prevention, protection and preparedness for future emergency situations (e.g. floods), and understanding citizens’ needs; (iii) implementing new approaches to e-participation in planning, decision making and governance.

A crucial difference between the two projects is that in the Sense4Us project, the primary stakeholders were policy-makers & their support staff of analysts and assistants at the EU Parliament, national (UK) and local (Germany - regional) levels, while in the WeSenseIt project the focus was on involving citizens and local authorities as core stakeholders. Below, we present the similarities and differences between the two cases to draw on the ways they complement and enrich our analysis within this paper:

**Table 1: Comparison of Case Study parameters**

<table>
<thead>
<tr>
<th>Focal elements</th>
<th>Sense4us</th>
<th>WeSenseIt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholders</td>
<td>Policy Makers, Analysts and Support Staff</td>
<td>Citizens, NGOs, Urban/Rural residents, Special Interest Groups</td>
</tr>
<tr>
<td>Policy contexts</td>
<td>Transport, Climate Policy, Migration, Health</td>
<td>Flood risk management, Environmental governance</td>
</tr>
<tr>
<td>Innovation and new participatory tools designed</td>
<td>Semantic/Sentiment Analysis tools for social media data, Linked Open Data, Policy modelling and simulation tool</td>
<td>Citizen observatories on flood risk management, data collection apps including feedback and visualisation, visualisation platforms, semantic social media analytics.</td>
</tr>
<tr>
<td>Multi-level governance process</td>
<td>Local, regional and EU level of Governance in UK, Germany, Belgium (EU Parliament), as well as peripheral cases in Sweden.</td>
<td>Local, and regional level of governance in case studies in Italy, the Netherlands, and the UK</td>
</tr>
</tbody>
</table>

**3.3 Method**

The data gathered, analysed and presented within this paper draws on a rich body of work spanning multiple actors within the two projects over three years. The data presented here is qualitative and was collected via semi-structured interviews, focus group sessions and questionnaires. Table 2 below presents a summary of the research landscape we traversed within the two case, whom we interviewed and what the body of data compromised:
Table 2: Summary of data collection instruments and respondents per case

<table>
<thead>
<tr>
<th>Sense4Us</th>
<th>WeSenseIt</th>
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<tbody>
<tr>
<td>• The data set consists of twenty four (n=36) interview transcripts. Of these, 24 were conducted during the initial round of requirements analysis, and comprised of ten at the level of the European Parliament, eight from the national level (UK) and six from the regional (German Westphalia County). The remaining 12 were conducted during the second and third year of the project on evaluation and validation exercises.</td>
<td>• The data set consists of:</td>
</tr>
<tr>
<td>• The respondents ranged from MEPs, to their assisting administrative staff, from members of the House of Commons in UK to regional ministers from the Bundestag in Germany.</td>
<td>• Transcripts of semi-structured face-to-face interviews (n=52) with leading staff for emergency and crisis control, planning as well as infrastructure maintenance at the local level, planning and emergency services at the regional level and (in the UK) the Environment Agency at the national level.</td>
</tr>
<tr>
<td>• The interviews cover a range of questions spanning an early stage requirements gathering and stakeholder mapping exercise, to latter reports of hands-on testing of the current iteration of the tool set by policy support staff in the UK, Germany and the European Parliament.</td>
<td>• Formal and informal discussions combined with observations throughout the life-time of the project involving the case study-related local authorities, professional users and trained (citizen) volunteers (e.g. regarding the selection of physical sensors for each case, identification of suitable locations for these sensors as well as mobile app functionalities, web-based data visualisation, feedback and interaction options).</td>
</tr>
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</table>

In both cases, the transcribed interviews were analysed according to the conceptual framework introduced in the previous section and the collected data triangulated with information from desk research, such as country reports about the implementation of relevant EU Directives (incl. the Water Framework Directive, Flood Directive) and the Aarhus Convention. In our analysis of the data, we take an Interpretivist stance. This is aimed at producing a closer understanding of how an information system influences and is influenced by its context (Walsham, G., 1993). A key task in interpretive research is seeking meaning in context - the subject matter is set in its social and historical context so as to better understand the evolution and emergence of outcomes (Klein, H. & Myers, M., 1999).

4. Results and Analysis

The overall objective within this section of the paper is to examine the implications that new digital e-participation tools might have for various ‘levels’ or ‘modes’ of governance and public accountability. In order to do so, we first dive into the question of who are selected to participate in the decision making process.

4.1 Understanding the “Stakeholders”

In Sense4Us, given that the primary focus was to design and develop tools to assist policy makers and their support staff, we spoke to those stakeholders already engaged within the process of researching and analysing diverse data streams to make more informed decisions. Our intention here was to better understand what their current use of e-participation tools was and how they perceived the added value of the new tools becoming available, for their everyday work context. During an interview with a senior UK civil servant, our discussion turned to the value of social media data in drafting policy:

“Social listening tools do not currently provide appropriate insights for policy-making as they are almost exclusively designed for marketers. As a policy-maker you are trying to capture the essence of online discussions and what that means for scoping and implementing policies.”

Thus what was articulated was a deficit in current practices for civic engagement within the policy context. What was felt to be missing, was a clearer picture on who was being targeted by a given policy, to build up knowledge of those people, understand when and how policy makers should intervene in discussions. There was a clearly articulated need to understand and be able to predict which types of people (demographics) will take part in specific discussions. He went on to say:
“Who they are, where they are, what things appeal to them” – this kind of knowledge would really help to understand different networks better and therefore how to best implement certain policies and know where areas of concern might be in relation to policies that are already implemented.”

Would the policy-maker be better off targeting electric cars at people who are environmentally conscious or at those who are more interested in saving money? The motivating factors are different for these two groups. Being able to know about groups that are currently not on their radar but are having related conversations elsewhere, was articulated as being very useful.

In WeSenseit, we saw a shift by the UK (local) authorities trying to change the mind-set of citizens from being a customer ‘receiving services’ to taking responsibility, including for flood risk management. There is a clear push for various stakeholders to collaborate (Environment Agencies (EA), local authority, communities) and this presents a shift in citizen e-participation to the start - rather than the end - of the planning process. For example, while the EA’s traditional way was to decide what flood risk schemes (e.g. infrastructure investments) needed to be done, then announce these and defend them, more recently, communities are expected to be more involved in the decision making process. The sequence of the project cycle for decision makers in this case has therefore changed from ‘design – defend – implement’ to ‘discuss – design – implement’ (Wehn et al. 2015). This presents a shift of the interactions with citizens to the start of the planning process, avoiding confrontation with communities just before project implementation. The municipal public authorities were seen to be proactively approaching the communities via the Parish councils and flood wardens (volunteer representatives from the local communities) to identify their biggest worries or perceived risks face-to-face.

4.2 The “When” and the “How” of e-participation

From the Sense4Us project, in our discussions with policy makers, we observed a marked hesitancy in the nature of, and stage at which, citizen inputs were sought. This was neatly captured in the response of an MP who articulated:

“In general the specialist divisions (e.g. energy) work together with domain experts – the federal government engages people from commerce (e.g. lobbyists) or recruits them to work on special legislative processes. The Internet plays a limited role within this process – during the legislative process the Internet will for instance be used to investigate third party opinions.”

Thus we find here an acknowledgement of the limited role non-expert opinions could be allowed to play within the remit of certain policy fields. Within WeSenseit too, we found in the Italian case context of Vicenza, that mostly ‘selective’ citizen e-participation was taking place and it was foreseen that it would be mainly citizen scientists and trained members of the Protezione Civile who would be consulted. In the case context of Delfland (the Netherlands), participation with citizens was found to be highly institutionalised and the role for citizens to influence decision-making was fairly limited or even passive, leaving little to no room for e-participation to change the existing paradigm.

In both our empirical cases, we find policy and decision makers expressed a relatively heavier preference to involve citizen scientists, trained volunteers, experts, local and regional authorities as opposed to lay citizens. The anticipated influence of the ‘citizen voice’ via the internet or social media, at a more general level was seen to be secondary to that of more targeted, expert groups. However, when it came to inputting data at the social sensor level as opposed to preference elicitation (i.e. choosing between policy options), policy makers in both cases were more open to “listening in” to gather a richer, more nuanced picture. In the section below, we consider how this form of e-participation manifested itself and towards what impact.

4.3 The question of trust

During an event where Sense4Us was presented to policy makers within a regional parliamentary context in Germany, we gathered some interesting insights into how the stakeholders (policy makers in this case) conceived of new participatory technologies that could assist in sense-making of data. Four MPs from the North Rhine-Westphalia region suggested that the toolset under development have two settings. These would be “light” and “advanced”. “Light” here would refer to the case where policy makers would see less information in contrast to “advanced”. This would enable them at the beginning to not use all background information that justifies the results of the algorithms. As and when the policy maker then became more
interested in the processes and the toolbox’s transparency, the user may switch to the “advanced” setting. This would come with the same standard functionalities, but shows more parameters and additional functionality. This would offer the opportunity to better trust the results and to justify why the results are trustworthy. What is of particular interest here, is that within the Sense4Us case, the end users participated at two levels. The first is the more obvious one in which their inputs, such as the one above regarding advanced settings, influence how policy makers can come to trust technological processes that inform their decisions and in return to inspire trust via the transparency that this affords. On the other level, we see an opening up of the e-participation process here, in the sense that citizens are invited to be witness to hitherto closed processes within governance – relating to how policy decisions are arrived at, and how their governments are informed. On this latter point, we witnessed some contention amongst our stakeholder group, where understandably some policy makers were happy to open up the dashboard to the public, while others less so. This links to the fear and hesitation on the part of those that currently wield the knowledge and information of decision making processes to open their practices to citizens and be thus open for scrutiny. From a technological standpoint the opportunity exists, however from the political perspective of how traditional governance is performed, this is seen as a key challenge.

Another factor to consider when investigating the leap from transparency to trust relates to the inherent risks built into the appropriation of data models to gain legitimacy (as we discussed in an earlier section of this paper). This concern was articulated by UK parliamentary officials, when they mentioned that MPs in particular were not sufficiently data literate to understand the limitations of the models put forward by such sense making technologies. They feared that they would not be able to fully question the data these models would be based on. This would, they argued, have direct bearing on their ability to participate in any meaningful way.

“You put a number on anything and it gives a certainty... as soon as you have numbers being bandied around there’s a risk that there might be too much certainty attached to anything that any model could come out with. Pitching it at a level that informs but doesn’t give more certainty than any model is ever going to be able to capture…”

The suggestion was made in a parliamentary focus groups that MPs would be likely to use a ‘killer fact’ to support a political point they were trying to make rather than using information they were sure was representative of the body of evidence around an issue. Providing context and guidance about how the tool should be used is therefore crucial if it is to be used by MPs or others with potentially low levels of data literacy. This raises the question of citizens rights and interests being protected rather than policy maker wielding such tools as the ones presented in Sense4Us and WeSenseIt, in order to entrench their already powerful positions and reinforce a status quo politically. Additionally, there is an inherent traditionalism about the way government in particular conducts business, and the suggestion from the interviews and focus groups was that although many participants were becoming familiar with the use of social media in engagement, outreach and marketing contexts, few could envisage the use of social media data in meeting their policy-development needs.

Similarly, in WeSenseIt, the authorities in all three case studies repeatedly expressed their concerns regarding trust and accountability for information made available via the respective observatories, how this would be interpreted and by whom (e.g. potentially causing panic among citizens based on biased or incorrect data). Each of the authorities made their own choice in being responsive in an equal dialogue with their residents. In the UK WeSenseIt case study, the platform was given to the community, as a communication channel, like Facebook and Twitter, on which everybody can post their water-related pictures, comments and concerns; communities use it to share experiences between neighbourhoods, to build reference points on water levels over time and to get information from the water levels sensors installed. The local authority is also active on the platform; posting, reacting to posts and comments and viewing the sensor data – but it is not responsible to provide an answer to or solve everything that is posted. If there is a serious issue that needs to be reported to - and dealt with by - the authorities in charge, the traditional routes (i.e. the emergency number and response procedures) are still standing procedure and not influenced by the observatory. In the Italian WeSenseIt case study, the authorities host a platform that is more closed: only trained volunteers are allowed to post information at moments that the authorities feel that additional ground level information is needed from a specific location. Finally, at the other extreme, in the Dutch WeSenseIt case study, the authorities decided that an observatory existing next to their traditional communication channels like the Customer Contact Center (KCC) would create confusion for the residents and new responsibilities for their employees;
when an alert is issued, the water authority will depend on its own data sources and sensors, arguing “It [data collection] is our responsibility, we should not be depending on citizens”. The observatory therefore does exist but separately and decoupled from the authority.

Linked to the above notion of trust is the ability to follow the evolution of discourse within any policy area. In other words, not only is the trust built along the dimension of transparency but also chronologically as those entrusted with making decisions can track the dynamic flows over time. Within the Sense4us project, we found that policy makers expressed what they were most interested in was the ‘delta’ or the change (evolution) of their search terms, since they last monitored a given topic. So for instance, in the case of Germany, where policy makers were researching the term ‘inclusion’ and ‘migration’, what became of key relevance to them, was to be able to track the evolution of discourse and the rate of change. By adding citizen discussions via social media here as a variable, we found a unique form of e-participation taking place, where citizens as social sensors, contributed their views, sentiments, knowledge and preferences, and in doing so formed an additional layer (to the big, open data), shaping the final policy under discussion.

4.4 The diversity of roles for social sensors within multi-level governance

Within the WeSenseIt project, we were reminded of the diversity of participatory relationships between citizens and their governments – an often forgotten attribute within much of current research, where “stakeholders” and “e-participation” are treated as blanket terms. In the Italy WeSenseIt case study, for example, e-participation was mainly focused on information exchange (to/from the citizens), with limited involvement on the part of citizens in more direct decision-making. While in the UK WeSenseIt case, we found a heavy reliance on regular and intense face-to-face contact and interaction with citizens; albeit with mostly older and less technology-savvy members of the communities. In the Dutch WeSenseIt case, participation with citizens was found to be ad hoc (depending on the project context); citizens were informed as opposed to consulted about plans and decisions. Thus we see here an expression of the ‘design-defend-implement’ paradigm, rather than a more concerted shift towards e-participation in the sense of genuine deliberation and negotiation. This serves to highlight the gap between what technological innovation (in this case the application of new participatory tools such as citizen science and policy modeling) makes possible, on the one hand, and the acceptance or openness on the part of decision makers to embrace citizen inputs on the other hand.

As the hesitation to use less formal methods to collect feedback from citizens suggests, policy makers from both projects said they needed reassurance as to the validity of the data collection and analysis methodologies related to social media data collection and usage. Thus we return to the issue of trust and provenance and are reminded of the (often tacit) boundaries to e-participation set in direct conflict with the rhetoric of the opening up of governance. This was illustrated within the WeSenseIt project, where the UK decision makers clearly felt the impact of social sensors would be to ‘advise and consult’ but not to co-govern. On a more positive note, they felt that such e-participation would definitely help bridge an existing gap (largely generational) by involving previously unengaged segments of the communities such as the Digital Natives and their parents. In the Dutch WeSenseIt case, we were informed that increasingly, tuning into social sensors, was being perceived by the authorities as an opportunity to hear the ‘voice of the citizens.’ How then this voice was translated into the policy agenda set and its implementation, remained an unanswered question.

4.5 Impact of e-participation - the political instrumentalisation of scientific facts

Within the Sense4us project, we were informed by an MEP’s assistant, of a very interesting case highlighting the tension that is created by new participatory tools based on social sensors:

“At the time of considering the Kyoto protocol (i.e. referring to Greenhouse emissions), all policy makers saw a scientific simulation of what will happen in the future, if this policy is adopted. We had scientific data and worked on this data for years and years but in the end it went to a different direction. Scientific truth is put into doubt by a political instrumentalisation. We can’t anticipate decisions as it is all politicization."

Two key points emerge from the above. The first relates to the lack of trust in “political artifacts” as opposed to “scientific facts”. This is attributed to the question: in whose interest are such tools deployed? Within both projects that we are considering here, there is an explicit concern articulated by citizens and experts (scientists) that politicians will use analytical as well as simulation tools to put a “political spin” on opinions
they give more weight to. The second point is that within debates on e-participation today, there is a heavy focus on technological design and what this enables, rather than on behavioural adaptation required for more sustainable outcomes. The above quote highlights this quite well, in that it showcases how the lack of behavioural change can result in new innovative designs being used to reinforce existing dichotomies. However, on a more hopeful note, the above MEP assistant went on to pinpoint:

“Scientific evidence is very interesting and important for the European Parliament because that would lead to no game between the opposition and the ruling party and ensure less instrumentalisation.”

In other words, he calls for a de-coupling of scientific fact or expert knowledge from political manipulation, within the decision making sphere. A similar de-coupling is called for by other policy makers in our sample, of citizen opinions emerging from social media and expert opinions emerging from emergency services (as in the flood risk management scenario we see in WeSenseit), in that the former are more subjective concerns of communities and hence open to greater manipulation.

Nevertheless, in all three WeSenseIt case studies, one of the first and foremost valued outcomes was that each observatory and its sensors leveled the access to relevant and specific information. In all three cases, the process of participating in the project was perceived as having enhanced existing conversations and discussions between authorities and citizens. The caveat, however, also in all three cases, was the ownership of the information and how to allocate the responsibility to act upon it - “who decides on when and how to take action”. This element of the equal dialogue between authorities and citizens generated tensions in all three case study areas, since all involved authorities realised that participation cannot be thought of lightly.

5. Discussion

While some approaches to analysing the impact of e-participation attempt to draw a straight line from individual actions or behaviors to policy or developmental outcomes, we argue that intermediate outcomes may be equally important. A summary of the intermediate outcomes and impacts of e-participation for our respective cases is provided in Table 3 below.

Table 3: Summary of intermediate outcomes and impacts of e-participation

<table>
<thead>
<tr>
<th>Outcomes and impacts of e-participation</th>
<th>Sense4us</th>
<th>WeSenseIt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roles for citizens</td>
<td>Envisioned citizens as advisors and scientific experts rather than co-creators of policy decisions</td>
<td>Scientific advisors and not decision makers</td>
</tr>
</tbody>
</table>
| Public accountability and legitimacy  | Hesitation to open up the processes to public scrutiny due to fear of criticism and misinterpretation of intent. | The new tools enhanced existing conversations and discussions between authorities and citizens. The caveat, however, was the ownership of the information and how to allocate the responsibility to act upon it - “who decides on when and how to take action”.
| Trust                                 | Lack of trust in the provenance of data sources and citizen inputs gathered from social media sources within the policy decision making context. | Trust in the equal dialogue between authorities and citizens generated tensions, since all involved authorities realised that participation cannot be thought of lightly. |
| Challenge faced                       | Gap between what the technical participatory tools enabled and what forms of citizen inputs policy decision makers were willing to integrate within traditional forms of governance. | Ad hoc engagement with citizen stakeholders in various roles (data collectors, advisors and feedback providers) where the design-defend-implement tradition was not shifted. |
Challenge faced Gap between what the technical participatory tools enabled and what forms of citizen inputs policy decision makers were willing to integrate within traditional forms of governance. Ad hoc engagement with citizen stakeholders in various roles (data collectors, advisors and feedback providers) where the design-defend-implement tradition was not shifted.

Within the Sense4Us case, we saw that policy makers were open to the idea of a greater scientific advisory role played by such tool sets, that could, in theory enable them to make more informed decisions. By addressing the complexity of information and providing an innovative, linked, as well as relevant projection of policy impacts, they felt their relationship with the communities they represented, would be strengthened. In the case of the WeSenseIt project, the coming together of diverse sensors (physical and social) the collaborative nature of knowledge co-creation was highlighted. Citizens were enthusiastic about what this could mean in terms of being given a greater role in managing and mitigating risks within their community.

However, the issues of public accountability and legitimacy emerged as key concerns on the part of authorities’ decisions based on citizens’ data, in both projects. This links clearly to the first assumption discussed in this paper regarding the transparency-trust relationship and the wider discourse on what counts as evidence in policy making (Adams and Sandbrook, 2013; Haddaway and Pullin, 2013). What policy makers expressed an unequivocal desire for, was a technology environment that would render political processes and decision making processes more trustworthy. However, the rationale for this was more to justify (defend) their decisions to citizens and not necessarily to bring on board citizen voices during early stages of deliberation.

Gaventa & Barrett (2012) suggest from their findings that we cannot consider “success of e-participation” and “level of democratization” to be linked in a linear or progressive manner. In addition, they argue that change happens through multiple types of citizen engagement: not only through formal governance processes, even participatory ones, but also through associations and social movements that are not created by the state. A typical example of this being discussions and movements emerging from the use of social media. Strengthening these broader social change processes, and their interactions, can in turn create opportunities for state reformers to respond to demands, build external alliances, and contribute to state responsiveness. The role of social media here is of critical importance. By capturing discussions and opinions within an informal sphere inhabited by citizens and initiated from a grassroots level, policy makers have a unique opportunity now to tap into sentiments, perceptions and priorities of the very groups that will be affected by the decisions they make. This does not stop at a one-directional “listening in”, but instead also includes a genuine dialogue where citizens and stakeholders are allowed to give iterative feedback on the design of both platforms and policies. In particular, as we have shown with citizen scientists and experts in the WeSenseIt project, this e-participation can take the form of data collection and provision, rather than relegating citizens to more tokenistic forms of engagement after policy decisions have already been made.

With the two platforms we have presented here, we see a shift away from tokenistic forms of e-participation towards more engaged and hands on participatory practices, albeit to varying degrees depending on the existing institutional setting. While this is a sustainable model to follow, what needs to be problematized here, is the way in which assumptions on the part of the designers of such platforms get built into the models, which are then used for predicting and influencing policy. One instance of this has already been discussed earlier on in this paper – the question of trust (or lack thereof) emerging from the political use of scientific artifacts. The predictive models being developed within the Sense4Us project, had one assumption underpinning them. This relates to the point we raised on interest and impact. The designers of the models build a platform with the assumption that the priorities and concerns of citizens/stakeholders will hold a higher position than those of the policy makers. This assumption does not always hold true, due to the resistance to behavioural change within multi-level governance environments.

This brings us to the second assumption we discussed in this paper, regarding the implicit belief that such innovations in the public sphere will be applied for societal benefit. As we have seen via the two cases presented here, while there is a clear motivation towards fostering dialogues with citizens (in their capacity as social sensors), incentives need to be built into the design of such initiatives, to motivate policy makers to listen and address citizen concerns, as well as motivate citizens to want to engage. Such incentives can be both technological and social. With regard to the technological, we argue that these incentives can take the form of transparency (two-way) and inter-connectivity. Transparency and openness in design can be built in to serve both decision makers and citizens alike, who can thus be motivated to engage in return for a better
understanding of the processes and outcomes. With regard to inter-connectivity, we refer to the ability to ‘connect the dots’, or relate diverse and complex information in an intuitive manner, allowing one to have a fuller understanding of the consequences or societal impacts of certain policy decisions. This we feel will make for a more sustainable model of engagement. However, on a more skeptical note, we find that transparency can act as a double-edged sword here, with the risk of increasing apathy amongst citizens, if participatory processes are manipulated to gain legitimacy alone, and no meaningful shifts in the imbalance of power are perceived.

With regard to social incentives, these can be more challenging to achieve. Apart from political cachet how can we engineer the motivations of a politician or citizen lobby to engage and act upon articulated concerns? Community grassroots initiatives (that are crowdsourced and bottom up in their design) are one indication of how change can be facilitated at this level. This is because, we argue, when an initiative emerges from a genuine articulated need (e.g. policy makers arguing for certain tools to assist them in making more informed decisions, or communities taking an initiative in flood risk management with very real outcomes for their neighbourhoods), then the adoption and engagement is more sustained, compared to initiatives where the design is more top down and the approach reflects a “build it and they will come” assumption. This also links to the third assumption discussed in this paper about the hidden costs of engagement. We appeal for observatories for citizens that are grounded in their current concerns and local decision making. For if the thrust of engagement is not bottom-up, as we observed in the WeSenseIt project, it is often more work than anticipated, to integrate the social sensor inputs within policy. The reduction of costs thus is not a factor of using technology to replace more traditional forms of participation, but stems from leveraging relationships built over time, between citizens and their governance authorities. This leveraging can be facilitated via innovative participatory tools that give a voice to hitherto silent stakeholders; however, the tools should remain a means and not become an end in the engagement exercise.

Finally, what can we generalise from the two case contexts presented here that can be taken away as learning points for future initiatives elsewhere? While the unique contexts of the two European Research Initiatives presented here, throw light on a specific geographic (European) and temporal reality, we believe there are several insights to be gained for multi level governance initiatives taking place elsewhere in the world, both now and in the future. These insights pertain to the need for genuine co-creation between citizens and policy makers around matters of concern, as well as the need for such initiatives to be driven by bottom up needs rather than top down policy mandates.

6. Conclusion

We find ourselves increasingly inhabiting a landscape where in theory many ICT-mediated artifacts, services and knowledge infrastructures exist as facilitators of transparency, openness and relatively low-cost engagement. And yet the gap that lies in realizing this potential and transforming these artifacts into capabilities and meaningful choices continues to grow. In this paper we asked: what is the impact of new digital e-participation tools on various levels and modes of governance and public accountability? What we found via our investigation of the two empirical cases is that while there is a marked shift taking place away from tokenistic forms of e-participation to more hands on ones, there still exist many challenges in the realization of the utopia of open governance. These challenges are directly related to the assumptions we foreground within this paper, namely assumptions regarding a homogenous, ill-defined “stakeholder” group, with a lack of grounded research on the needs, fears, expectations and motivations of multiple actors involved.

Furthermore, we argue that the very processes of e-participation need to be conceptualized as evolving, unfolding layers of engagement rather than as a one-off design event. Through two case studies, we demonstrated the threshold of e-participation as it varied across national, regional and administrative boundaries. We focused on the hesitation on the part of policy makers to engage with citizens in informal processes of data gathering and preference elicitation. We also examined critically the preference to date, on the part of decision makers, to bring citizens (scientists, sensors) on board as advisors, rather than as co-creators of policy. We highlighted the motivations on the part of the decision makers, which vary from tokenism, legitimization of entrenched interests to an inertia in response to change in power structures. We argue that the application of such new forms of e-participation (ranging from citizen science to policy modeling and simulation based on social media discourse) need to be driven bottom up by citizens, that wield the tools for grassroots, community interests as opposed to building political cachet.
With regard to the new understandings emerging from our paper and their relevance to the transforming landscape of policy making, these are threefold. First, we examined the new role of participants as “social sensors” in shaping policy decisions. We found great potential in fields such as flood risk management (in the case of WeSenseIt) and policy modeling (in the case of Sense4us) for crowdsourcing citizen knowledge, needs and preferences. However, our study shows that this potential can only truly be realized when the role of these social sensors is transformed from advisors to co-creators of policy. Second, we looked at the ‘point of initiation’ in e-participation. In other words: where does the engagement take place and are these artifacts evolving from an organic need expressed by citizens and policy makers, or is it a more top-down, technology push, where platforms are built and then applied to a given context, with e-participation tagged on as an afterthought? We argue for citizens to take on the role of data providers from an early stage of policy agenda setting, rather than towards the end of the process. Finally, we examined the assumption that transparency in design and openness of data necessarily equals greater democracy or a leveling of the playing field in policy decision-making. In conclusion, we suggest that a lot more thought and effort is needed to build trust and meaning within the context of multi-level governance and e-participation. As a step towards that direction we need to challenge assumptions entrenched in the very fabric of our technical design and governance processes by opening the doors for more genuine co-creation between decision makers and citizen stakeholders.

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Systematic Literature Review on Enterprise Architecture in the Public Sector

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Abstract: Enterprise architecture (EA) is an approach to improve the alignment between the organization's business and their information technologies. It attempts to capture the status of the organizations' business architecture, information resources, information systems, and technologies so that the gaps and weaknesses in their processes and infrastructures can be identified, and development directions planned. For this reason, EA has become a popular approach also in the public sector to increase their efficiency and ICT utilization. Yet researchers have largely ignored this context, and it seems that quite little is known about how EA is developed, implemented, or adapted in different countries and in the public sector. We thus conducted a systematic literature review to identify the major research topics and methods in studies focusing on public sector EA. We analyzed 71 identified articles from the past 15 years. Our analysis shows that the development viewpoint, case studies in developed countries, and local settings seem to form mainstream EA research in the public sector. Taken together, it seems that public sector EA is scattered, and there is no strong, single research stream. Instead the researchers conduct local case studies. This means the knowledge on EA development, implementation or adaptation, their challenges and best practices does not accumulate. There is consequently a need for more research in general, and targeted research in some specific segments.

Keywords: Enterprise Architecture, Public Sector, Systematic Literature Review, Government Enterprise Architecture.

1. Introduction

The enterprise architecture (EA) concept has increasingly gained the attention of public sector actors around the world. By 2007, Liimatainen et al. (2007) stated that 67% of countries were implementing EA or similar programs, and up to 93.3% of countries were planning to launch EA initiatives within a year or two. However, these initiatives turned out to be difficult to implement, despite EA providing numerous benefits. For instance, it may play an important role in achieving better connectivity and interoperability between information systems, rationalizing data structures, unifying business processes, and standardizing technologies (Saha, 2010; UN, 2008; OpenGroup, 2008). In fact, numerous EA benefits, such as improved decision-making, reduced IT costs, better business-IT alignment, re-use of resources, and regulatory compliance, among many others, have been identified (Tamm et al., 2011; Boucharas et al., 2010; Kappelman et al., 2008; Lange et al., 2012; Niemi & Pekkola, 2017).

Despite the evident benefits, EA initiatives seem to face challenges in practice (e.g. Alwadain et al., 2015; Bui et al., 2015; Kimpimäki, 2014). Thus, it is easy to press for more research and practical guidance. However, as the public sector and the private sector are fundamentally different in terms of environmental factors, transactions, structures and processes, and goals (Caudle et al., 1991), private sector studies, often focusing on EA development methods and frameworks (Rouhani et al., 2015; Simon et al., 2013), do not provide adequate instructions for the public sector.

So, despite there being several studies on EA utilization in public sector activities (Hjort-Madsen, 2007; Lemmetti & Pekkola, 2012), little is actually known about the broad spectrum of EA. For example, Rouhani et al. (2015), Scholl et al. (2011), and Simon et al. (2013) all point out the need for understanding more about EA in general, and in the public sector in particular. In the public sector context, Scholl et al. (2011:353) stated that

“...we dismiss the drive for establishing Enterprise Architectures in the public sector as inappropriate and problematic, at a minimum. Institutional architectures represent governance structures, and interoperability in the public sector requires governance structures different from the private sector.”
This motivates our study, in which we conduct a systematic literature review on “how EA has been studied in information system research in the public sector, what are the main research topics there, and what are the main themes related to EA in the public sector.” We utilize the pragmatic guidelines of Kitchenham and Charters (2007) to review and analyze what categories, issues, geographies, countries, methods, and approaches are common in public sector EA research.

The paper is organized as follows. First, we present the background literature, and then describe the sample and methods in Section 3. We use the subsequent section to provide the results of a content analysis of 71 research articles. In Section 5 we discuss the results, and we provide conclusions in Section 6.

2. Background

2.1 EA and EA in the public sector

Enterprise architecture is an approach for managing the complexity of an organization’s structures, business environments, and different information systems, and for facilitating the integration of strategy, personnel, business, data, and IT (Goethals et al., 2006; Hjort-Madsen, 2006; Kluge et al., 2006). It provides a collage of several architectural models, such as business architecture, information architecture, information systems architecture, and technology architecture (Jonkers et al., 2006; Lankhorst et al., 2005). Those models describe the current situation of the organization, conceptualize its future vision, and provide a transition plan for how to reach the future vision (Armour et al., 1999; Lankhorst et al., 2005). In other words, EA provides a holistic view of the organization and its different components and structures, and thus can be seen as “a kind of city plan that details policies and standards for the design of infrastructure technologies, databases, and applications” (Ross, 2009:172).

Despite this high-level conceptualization, there is no globally accepted definition of EA (Niemi & Pekkola, 2017; Tamm et al., 2011). As it is often understood either as a taxonomy, a methodology, or a masterplan, and perhaps even all three simultaneously, EA endeavors are challenging (Niemi & Pekkola, 2017; Rohloff, 2005). However, the term ‘enterprise’ indicates that EA could be used to consider a company, an institution, or a department within a company or an institution (Guijarro, 2007), while the term ‘architecture’ aims at creating some kind of structure of a complex and isolated environment using systematic approaches (Armour & Kaisler, 2001). In the public sector context, EA is also referred to as Government Enterprise Architecture (GEA), National Enterprise Architecture (NEA), or e-government Enterprise Architecture (Lilimatainen et al., 2007).

The EA concept has indeed been used in the public sector (Guijarro, 2007; Hjort-Madsen, 2007; Lemmetti & Pekkola, 2014; Peristeras & Tarabanis, 2000). One of the most popular applications is its use as a methodology to improve the interoperability and efficiency of inter- and intra-organizational IT systems (Hiekkanen et al., 2013; Hjort-Madsen, 2006; Janssen et al., 2013; Lemmetti & Pekkola, 2014). Other uses include strategic planning and data stores consolidation, among others (Hjort-Madsen, 2007; Boucharas et al., 2010; Nilsson, 2008; Ross & Weil, 2005). These initiatives are usually voluntary, although some law-mandated examples exist, as in the U.S. (“The E-Government Act,” 2002) and Finland (“Act on Information Management Governance in Public Administration,” 2011).

Governments normally consist of many agencies with different structures and service/business-areas. This often leads to duplicated information systems and fragmented business services and process, decreasing the possibility of cross-agency interoperability (Saha, 2010). Therefore, governments pursue EA initiatives, in addition to the aforementioned general EA benefits, to allow for end-to-end business processes across all state agencies, to increase online services (Saha, 2010), to provide new tools to manage business and IT alignment within agencies for better integration of technologies, to rationalize data structures and applications, and to provide business modularity (OpenGroup, 2008; Ask & Hedström, 2011; Guijarro, 2007).

2.2 Related literature reviews

Several literature reviews on EA have been conducted. Those include Langenberg and Wegmann (2004), Schelp and Winter (2009), Schönherr (2008), and Simon et al. (2013), which all investigate EA research in general, Lucke et al. (2010), which studies critical success factors, and Makola and Hotti (2013), which focuses on critical success factors in healthcare sector. Mykhashchuk and Schweda (2011) and Winter (2010) used a literature review to study enterprise architecture management, Andersen and Carugati (2014) to investigate enterprise architecture evaluation, and Boucharas et al. (2010) to study EA contributions.
None of these reviews, however, focused on EA and the public sector. Nevertheless, some EA public sector literature reviews have been conducted (Tambouris et al., 2014; Zheng & Zheng, 2013), but their focus is very narrow: services provision systems requirements (Tambouris et al., 2014) or public sector EA within a single country (Zheng & Zheng, 2013).

Consequently, there is evidently a need for a literature review that maps research into public sector EA in order to understand what is known, or not known, in the field.

3. Research method

Our study follows Kitchenham and Charters’ (2007) practical guidelines, which comprise of three main stages: planning, execution, and result analysis. We will first focus on the planning and execution stages to describe how we carried out our review.

3.1 Databases and keywords selection

In order to gain understanding of the state of public sector EA research, we decided to focus on scientific databases. We identified and selected the following sources as they cover the field of public sector EA and provide access to relevant publications. These databases also have the highest impact and include the most important articles from journals and proceedings. They are:

- AIS Electronic Library (http://aisel.aisnet.org/)
- ACM Digital Library (http://portal.acm.org)
- IEEE Xplore (http://www.ieee.org/web/publications/xplore/)
- Science Direct – Elsevier (http://www.elsevier.com)
- Springer Link (http://www.springerlink.com)
- Taylor and Francis (www.tandfonline.com)
- Google Scholar (www.scholar.google.com)

We started by identifying relevant search terms, which we defined after an initial literature search of known EA articles and their reference lists. In particular, we looked at the titles and keywords, and analyzed the abstracts and skimmed the contents. The final search terms were all potential combinations of ‘enterprise architecture,’ ‘public sector,’ ‘public ICT,’ ‘electronic government,’ ‘public administration,’ ‘public organization,’ ‘government enterprise architecture,’ ‘national enterprise architecture,’ ‘government architecture,’ ‘e-government enterprise architecture,’ and ‘government EA.’

3.1.1 Criteria and selected articles

Every article that matched the search criteria was recorded (this resulted in 1858 candidate articles), and the first author then reviewed and re-reviewed each article. As suggested by Kitchenham and Charters (2007), we used the following inclusion and exclusion criteria:

- Inclusion: English peer-reviewed studies, including conference proceedings, journal articles, and book chapters; studies that focus on EA in the public sector.
- Exclusion: Studies not in English; studies not related to the research questions; duplicated studies; short articles.

After excluding the articles using the exclusion criteria (the number of candidate articles was reduced to 184), the rest were analyzed in detail. The analysis of their titles and abstracts (number of candidate articles was reduced to 116) and an evaluation based on the full text reduced the number of candidate articles to 71. We repeated this analysis in a random order to ensure no mistakes were made. Finally, the reference lists of the candidate articles were checked to guarantee we included all representative articles. Table 1 shows the number of articles per source and in the selection process.
Table 1: Selected articles based on keywords

<table>
<thead>
<tr>
<th>Source</th>
<th>Keyword search</th>
<th>Candidate</th>
<th>Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-gov Lib</td>
<td>54</td>
<td>51</td>
<td>27</td>
</tr>
<tr>
<td>AISeL</td>
<td>13</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>ACM</td>
<td>167</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>TandFonline</td>
<td>32</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Elsevier</td>
<td>46</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>IEEE</td>
<td>187</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>Springer</td>
<td>559</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Scholar</td>
<td>800</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>1858</td>
<td>116</td>
<td>71</td>
</tr>
</tbody>
</table>

Our sample thus consisted of 71 articles: 50 (70.42%) published in conference proceedings, 18 (25.35%) in journals and 3 (4%) in books.

3.1.2 Qualitative analysis

After identifying the articles, we analyzed them in detail. For each article, we recorded their bibliographical information (author affiliation, year of publication, type of publication), research methods used, number of citations, and content-specific issues, such as the coverage and objective of the study. We also classified the articles according to their topic, i.e. whether the article focused on developing EA initiatives in that country (development), implementing EA, i.e. utilizing the models and frameworks (implementation), or adopting EA, i.e. how EA practices are rooted in the organizations (see Figure 1 for details). Finally, we recorded their research methods and scope (whole government, specific organization or agency, or some subsection).

![Figure 1: EA categories in the public sector](image)

Figure 1: EA categories in the public sector

We also identified the main research issues for each article, which are listed in Table 2.

Table 2: Research themes that emerged from the articles

<table>
<thead>
<tr>
<th>Themes</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interoperability and integration</td>
<td>Those focusing on interoperability, integration, or both.</td>
</tr>
<tr>
<td>EA maturity</td>
<td>Those focusing on EA maturity, EA evaluation, and assessment.</td>
</tr>
<tr>
<td>EA alignment and strategy</td>
<td>Those focusing on alignment, strategy, or both.</td>
</tr>
<tr>
<td>Framework</td>
<td>Those focusing on frameworks, including interoperability frameworks, business architecture frameworks, evaluation frameworks, reference EA, and issues related to frameworks.</td>
</tr>
<tr>
<td>Modeling</td>
<td>Those focusing on models or modeling, such as the benchmarking model, domain model, data model, and issues related to models.</td>
</tr>
<tr>
<td>Role of EA</td>
<td>Those focusing on the role of EA in the public sector.</td>
</tr>
</tbody>
</table>
Themes | Descriptions
--- | ---
Developing EA | Those focusing on how agencies are developing EA
Implementing EA | Those describing how agencies are implementing EA.
Using EA | Those focusing on how agencies use and/or understand EA
General | Those focusing on EA in general, such as EA skills, concepts, use, and impact.

### 3.1.3 Extraction form

After identifying different categories and criteria, we collected the following information from each article. Figure 2 illustrates a data extraction form for each article. The extraction forms and all the codes are summarized as Appendix A.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topics</td>
<td>Articles belong either to development, implementation, or adoption EA, or to multiple categories, which are defined in Figure 1.</td>
</tr>
<tr>
<td>Themes</td>
<td>Description of the articles’ main research themes, which are defined in Table 2.</td>
</tr>
<tr>
<td>Bibliographical information</td>
<td>Authors, year of publication, title, and source of publication.</td>
</tr>
<tr>
<td>Publication type</td>
<td>Book, journal article, conference article, workshop article.</td>
</tr>
<tr>
<td>Quantitative relevance</td>
<td>Included communities, geography, coverage, research methods, distribution, number of citations, and country of research.</td>
</tr>
</tbody>
</table>

**Figure 2:** Data extraction form

### 3.1.4 Quality assessment

In addition, in order to assess the quality of each article, we defined four quality assessment questions (QA) to check the biases and validation of the proposals (Kitchenham & Charters, 2007). Each article was scored according to the quality assessment questions (Table 3). Positive answers were valued as one (Y), negative as zero (N), and partly as 0.5 (P). All included articles earned a score of three or higher (see Appendix A for scores). We therefore consider that the quality of the sample was adequate.

**Table 3:** Quality assessment questions

<table>
<thead>
<tr>
<th>No.</th>
<th>Questions</th>
<th>Y</th>
<th>P</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-1</td>
<td>How clearly did the context of the selected article relate to the public sector?</td>
<td>It stated clearly that it was a study of EA in the public sector.</td>
<td>It was only mentioned or described on occasion.</td>
<td>It neither mentioned nor described a study of EA in the public sector.</td>
</tr>
<tr>
<td>Q-2</td>
<td>How well are the main topics of the selected articles mentioned?</td>
<td>It explicitly mentioned issues.</td>
<td>It described or mentioned issues, but not clearly.</td>
<td>It did not mention or describe issues.</td>
</tr>
<tr>
<td>Q-3</td>
<td>How well are the categories of selected articles described?</td>
<td>It explicitly described them.</td>
<td>It mentioned or described them, but not clearly.</td>
<td>It did not mention or describe them.</td>
</tr>
<tr>
<td>Q-4</td>
<td>How clear are the communities, geographical distribution, coverage, and methods mentioned?</td>
<td>It clearly stated all of the aspects.</td>
<td>It mentioned one/some of them.</td>
<td>It did not state them clearly.</td>
</tr>
</tbody>
</table>
4. Results

In this section, we present both the qualitative and quantitative results.

4.1 Qualitative findings

4.1.1 Topics and main research themes

In order to answer the question “What are the main research topics related to EA in the public sector?” we classified each article’s research topic. The majority focused on EA development (36 articles; 56.25%), while 14.06% (9 articles) focused on EA implementation, 29.69 % (19 articles) on EA adoption, and 10.94% (7 articles) on two or three of these topics (Figure 3).

![Figure 3: Research topics on EA in the public sector](image)

We also identified the research themes. Figure 4 show that studies on frameworks accounted for 33.80% (24 articles), followed by using EA with 21.12% (15 articles). The two groups with the lowest number of articles were developing EA and EA alignment and strategy, which both accounted for approximately 2.81% (2 articles), while other themes accounted for 4.22% to 9.85% (3 to 7 articles).

![Figure 4: Research themes on EA in public sector](image)

Our findings showed that the public sector seems to be using their own frameworks instead of using current, established frameworks, such as Zachman (Sowa & Zachman, 1992; Zachman, 1987), TOGAF (TOGAF, 2011), or FEAF (U.S. CIO, 2013). This happens, for example, in Korea (Lee & Kwon, 2013; Lee et al., 2013), Singapore (Saha, 2009), and Thailand (Suchaiya & Keretho, 2014). Moreover, many governments were very flexible towards GEA concept. The agencies, within the governmental bodies, select their own frameworks based on the factors such as economic, socio-economic, infrastructure status, and business status (Janssen & Hjort-Madsen, 2007; Janssen & Cresswell, 2005; Lemmetti, & Pekkola, 2012). The detail about the selected articles and their content is listed in Appendix A.
4.1.2 Cross-analysis between themes and topics

We used cross-analysis between themes and topics to get insights about public sector EA research. As presented in Table 4, the majority of articles focused on EA development, EA implementation, and EA adoption. They belonged to the themes of frameworks (19 out of 36 articles), implementing EA (6 out of 9 articles), and using EA (10 out of 16 articles) respectively.

It is worth mentioning that EA alignment is an important feature of EA (Gregor & Martin, 2007; Lemmetti & Pekkola, 2014) that has not been extensively studied. Indeed, only two articles (Gregor & Martin, 2007; Gregor & Martin, 2002) focusing on EA development addressed the issue, and no other article considered it. Appendix B provides more detail about the articles and the relationships between different themes and research topics.

Table 4: Themes addressed in the articles, and the number of articles on each topic

<table>
<thead>
<tr>
<th>Themes</th>
<th>EA development</th>
<th>EA implementation</th>
<th>EA adoption</th>
<th>Overlapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interoperability and integration</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EA maturity</td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>EA alignment and strategy</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Framework</td>
<td>19</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Modeling</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role of EA</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Developing EA</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Implementing EA</td>
<td></td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Using EA</td>
<td></td>
<td></td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>General</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.2 Quantitative analysis

In this section, we provide the results of our quantitative analysis from two different perspectives: distribution over time and geography. This included consideration of authors and co-authors, research methods used, country specificity, and scope and coverage, i.e. whether the focus was at an international, central government, lines of business, local, provincial or regional, or municipality level. Finally, a brief citation analysis allowed us to identify the most influential articles.

4.2.1 Geographical distribution

The analysis of first authors and their home countries revealed that almost two thirds of studies on public sector EA originate from Europe, with a quarter from Asia and marginal contributions from the Americas, Oceania, and Africa. This shows that EA research is largely driven by European researchers. An explanation for the strong Europe-Asia dominance could relate to the attention paid to EA by several governments in those regions (Table 5).

Table 5: Number of publications by geography and by countries

<table>
<thead>
<tr>
<th>Number of publications by geography</th>
<th>Number of publication by developed/developing countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>No. of Pub (First author)</td>
</tr>
<tr>
<td>Europe</td>
<td>43</td>
</tr>
<tr>
<td>Asia</td>
<td>16</td>
</tr>
<tr>
<td>Americas</td>
<td>6</td>
</tr>
<tr>
<td>Oceania</td>
<td>4</td>
</tr>
<tr>
<td>Africa</td>
<td>2</td>
</tr>
</tbody>
</table>
In a similar vein, almost four out of five articles come from the developed world, with only around 20% from developing countries. Furthermore, the articles from the developing world mainly focus on the frameworks in the development category (10 out of 15 articles).

Table 6 illustrates how the articles are scattered across different topics; while 42 articles (59.15%) focused on a country, 12 (16.90%) compared two or more countries. The results indicate that studies that compare more than two countries’ EA adoption and implementation are either complex to conduct, because of the need for in-depth understanding of EA practice and the need to cooperate with government agencies, or have not been of interest to researchers. For example, no article in the implementation category uses comparative research.

Table 6: Country-specificity of articles according to the topics

<table>
<thead>
<tr>
<th>Group</th>
<th>Single country</th>
<th>Comparative between more than two countries</th>
<th>Not mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>13</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Implementation</td>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adoption</td>
<td>16</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Overlapping</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>12</td>
<td>17</td>
</tr>
</tbody>
</table>

4.2.2 Distribution over time

Figure 5 illustrates how the number of public sector EA studies has increased rapidly since 2007.

![Number of articles each year](image)

From 2007 to 2015, 59 articles (about 83%; approximately 7 articles per year) were published, while prior to this there were only 12 articles (about 17%; roughly 2 articles per year). This indicates that public sector EA is getting more attention. Analyzing the authors’ geographical distribution reveals that scholars from Asia and the developing world in particular have become active. The Asian group (19.72%) of EA researchers is the second largest group after Europe (60.56%). Moreover, 56 articles had authors from the developed world (78.87%), and 15 (21.13%) had authors from the developing world (10/15 from Asia, 5/15 from Africa).

4.2.3 Communities

Whether the articles are written by practitioners or academics indicates something about their practical relevance. We thus analyzed all authors and their backgrounds. Four categories of author groups were identified: academics, academics and government agencies, academics and enterprises, and government agencies (Table 7). Most articles were written by academics (59 articles, 83.10%), or by academics and government agencies (8 articles, 11.27 %). The other single articles were by government agencies (3 articles, 4.23%) or academics and enterprises (1 article, 1.41%).

Table 7: Number of publications by author background

<table>
<thead>
<tr>
<th>Categories</th>
<th>No. of articles</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academics</td>
<td>59</td>
<td>83.10%</td>
</tr>
<tr>
<td>Academics and government agencies</td>
<td>8</td>
<td>11.27%</td>
</tr>
<tr>
<td>Government agencies</td>
<td>3</td>
<td>4.23%</td>
</tr>
<tr>
<td>Academics and enterprises</td>
<td>1</td>
<td>1.41%</td>
</tr>
</tbody>
</table>

Although academics’ articles were written for academic purposes, it should be noted that they might still have a strong practical relevance (see Section 4.2.4). Interestingly, from 11 articles by governmental authors, 5 originate from the same group of authors in Greece (Peristeras & Konstantinos, 2004; Peristeras & Tarabanis, 2000; Peristeras & Tarabanis, 2004; Tarabanis, 2001; Peristeras, 2004). Given that there was also another Greek study (Anthopoulos et al., 2010), Greek dominance in public sector EA practitioner research is evident. Other countries include Finland (two articles by the same group), South Korea (two articles by the same group), and Bangladesh (Azad et al., 2008).

The only article resulting from enterprise-academic cooperation studied the maturity of EA programs and interoperability collaboration in 13 countries (Gøtze et al., 2009).

4.2.4 Scope and coverage

Figure 6 shows that 59% (42 articles) of the articles focus on single country-specific issues. Of those, 12 are Finnish studies. Far behind is the U.S. with six articles, Australia and the Netherlands with four articles each, India and Italy with three articles, and Korea, Sweden, and Denmark with two articles. Of the 12 (17%) comparative studies, the majority compare different European countries (9 out of 12). Interestingly, 17 articles (24%) do not clearly state where the study was conducted as their focus was, for example, on theory or documentation, such as frameworks or modeling.

Figure 6: Geography of research

We then divided the articles into five groups: international, focusing on two or more countries; central, focusing on the central government in a country; local, focusing on a certain province, region, or municipality; line of business (LoB), focusing on the lines of business; and a general group for generic EA studies, such as those on developing frameworks.

Most articles (47.89%) do not indicate any particular coverage but remain generic (see Table 8), followed by two groups, international and LoB, with 17.65% and 14.08% respectively, 10.29 % on a certain central government, and 7.35% on a local level (e.g. provincial, regional, municipal).
Table 8: Article coverage by group

<table>
<thead>
<tr>
<th>Topic</th>
<th>General</th>
<th>International</th>
<th>Central government</th>
<th>Local</th>
<th>LOB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>23</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Implementation</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Adoption</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Overlapping</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>12</td>
<td>8</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>%</td>
<td>47.89%</td>
<td>17.65%</td>
<td>10.29%</td>
<td>7.35%</td>
<td>14.08%</td>
</tr>
</tbody>
</table>

There are several reasons for this kind of distribution. Research tries to generalize the results, making the generic development studies common. Similarly, local practices are reported mainly in the form of case studies, making generalizability and potential theory building more difficult. This issue is emphasized in EA research, which still seems to be relatively practitioner-oriented.

In terms of the LoB analysis level, development and implementation both have four articles, while adoption accounts for three articles. Moreover, if these ten articles and their point of foci are analyzed in detail, their business areas are revealed. Eight areas emerging from the data are show in Table 9. This indicates that no particular business area dominates EA research, although healthcare has gained slightly more interest. However, it is evident that many LoBs have not applied EA, or have reported it in the form of academic publications. In addition, EA research seems to lack studies on many important lines of governmental activities, such as taxation, customs, or education.

Table 9: Detail of LoB area

<table>
<thead>
<tr>
<th>#</th>
<th>Area</th>
<th>Number of articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Healthcare</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Statistics</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Immigration and naturalization services</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Digital preservation</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Road administration and state treasury</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Lands management</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Social services</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>10</td>
</tr>
</tbody>
</table>

4.2.5 Research methods

We adopted Zheng and Zheng’s (2013) framework to categorize the research methods used in the articles. However, based on the characteristics of the articles, we decided to add the new category of design science research (DSR), which refers to the construction of an artifact and its evaluation (Hevner et al., 2004; Sein et al., 2011).

Table 10: Research methods

<table>
<thead>
<tr>
<th>Factor</th>
<th>Research methods</th>
<th>Number of articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical (11)</td>
<td>1.1 Theoretical framework building</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>1.2 Critical literature review</td>
<td>2</td>
</tr>
<tr>
<td>Empirical (42)</td>
<td>2.1 Interview</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>2.2 Survey</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>2.3 Observation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2.4 Secondary data</td>
<td>6</td>
</tr>
</tbody>
</table>
Table 10 illustrates that there are 11 articles using a theoretical approach; empirical methods account for 42 articles, including 14 articles using case studies, 6 using interviews, and 7 using surveys; 19 articles are descriptive and 3 use prescriptive studies. Although the case study method appears dominant, a variety of different approaches is evident. This can be seen as either positive, since the topic is being approached from several viewpoints, or as negative, as the studies seldom replicate others.

Three articles use multiple research methods; Janssen (2012) and Scholl et al. (2011) combine interviews and surveys, and Strano and Rehmani (2007) use interviews, observations, and secondary data.

4.2.6 Number of citations

In order to identify the core literature, the most-cited articles were identified by using Google Scholar. The 71 selected articles were cited 1027 times in total, giving an average number of citations of 14.46. The ten most-cited publications are listed in Table 11. However, it should be noted that the number of citations tends to increase over time, so the list may change within a few years.

Table 11: Most cited public sector EA articles by February 2016

<table>
<thead>
<tr>
<th>Articles</th>
<th>No. of citations</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>V. Peristeras &amp; Tarabanis, 2000</td>
<td>115</td>
<td>European Journal of Information Systems</td>
</tr>
<tr>
<td>Gregor et al., 2007</td>
<td>88</td>
<td>Information Technology &amp; People</td>
</tr>
<tr>
<td>M. Janssen &amp; K. Hjort-Madsen, 2007</td>
<td>72</td>
<td>Hawaii International Conference on System Sciences</td>
</tr>
<tr>
<td>Hjort-Madsen, 2006</td>
<td>63</td>
<td>Hawaii International Conference on System Sciences</td>
</tr>
<tr>
<td>M. Janssen &amp; Kuk, 2006</td>
<td>58</td>
<td>Hawaii International Conference on System Sciences</td>
</tr>
<tr>
<td>V. Peristeras &amp; Konstantinos, 2004</td>
<td>50</td>
<td>International Conference on Electronic Commerce</td>
</tr>
<tr>
<td>Strano &amp; Rehmani, 2007</td>
<td>43</td>
<td>Information Systems and e-Business Management</td>
</tr>
<tr>
<td>V. Peristeras, 2004</td>
<td>42</td>
<td>Knowledge Management in Electronic Government</td>
</tr>
<tr>
<td>Pardo, Nam, &amp; Burke, 2012</td>
<td>35</td>
<td>Social Science Computer Review</td>
</tr>
</tbody>
</table>

5. Discussion

The majority of public sector EA research focuses on EA development (56.25%). In comparison, EA implementation accounts for 14.06% of articles, which indicates that researchers are not yet involved comprehensively in EA practices and activities. Consequently, EA seems to represent more of a practical approach than a theoretical view as, for example, attempts at broader theory development are scarce. This can be explained by pragmatic issues, as the researchers need to first be involved in the practical field, where many agencies have not gained experience from implementing or adapting EA. Theory development is thus very difficult in this immature field, and governmental agencies are still drafting their EA models and developing appropriate practices and processes.

Most public sector EA studies focus on frameworks and modeling (31/71, roughly 43.66%) and on the issues relevant to using EA (15/71, approximately 21.12%). Although this trend of focusing on frameworks seems
Dinh Duong Dang and Samuli Pekkola

promising in terms of cumulative knowledge, each government, unfortunately, develops, tailors, and uses a framework based on their own economic, socio-economic, and infrastructure status. They seem not to be using popular, established frameworks such as TOGAF, FEAF, and ZACHMAN (Urbaczewski & Mrdalj, 2006). This finding parallels with the literature that the EA practitioners tend to use the frameworks and methodologies either as idea contributors, or just adapting them according to their own needs (Kotusev & Storey, 2015; Lange & Mending, 2011; Smith et al., 2012). As a result, this makes it very difficult to find any common aspect among the EA frameworks in the public sector. Consequently, one evident avenue for future research is considering this perspective, such as how, why, and which condition governments can or cannot use existing frameworks, and how to reduce their complexity (c.f. Saha, 2007).

In contrast, there seems to be a lack of studies focusing on EA maturity, alignment, and strategies, and evaluation. In addition, missing are studies on policy or policy-making, governance, and security (e.g. how policies impact to GEA implementation, which content should be considered for EA implementation, EA adoption); on the identification of ICT literacy, on the actors and users’ skills, and on their characteristics, particularly in the developing countries (and studies comparing those to developed countries).

In the selected articles, literature does not seem to clearly distinguish the difference between public sector EA and private sector EA, or whether there is any difference. Further research on public sector EA and its specific needs need to be considered. For example, Ojo et al. (2012) argued that more than 40% of the GEA programs were terminated due to poor execution. Yet, those failures are not reported in the EA literature. The studies of such failure would be highly valuable for everyone launching EA initiatives, whether in the private or public sector. However, as the public sector is constantly examined, evaluated, and monitored by the media and citizens, their EA investments and failures are equally examined. Poor EA implementation and execution easily lead to increased public spending, little reward, and the denouncement of failing EA. As the EA benefits are evident (Tamm et al., 2011; Boucharas et al., 2010; Kappelman et al., 2008; Lange et al., 2012; Niemi & Pekkola, 2017), the need to understand and steer EA implementation and adaption is thus evident.

The interest in public sector EA seems to be gaining more attention. Analyzing the past 15 years, we find that most articles were published from 2007 to 2015 (59 articles, 82.35%). This trend reflects governments’ attention to EA, and parallels the claim of Liimatainen et al. (2007) that up to 93.3% of countries were planning to launch EA initiatives soon. Researchers seem to have followed the practitioners here.

Public sector EA has gained increasing interest from scholars from Asia and the developing world (all of their research was published after 2008). The Asian group (22.54%) of EA researchers is also the second largest group after the Europeans (60.56%). This indicates that public sector EA studies are primarily driven by Europe, which is in line with Simon et al. (2013). However, those involved in EA in Asia and developing countries will press for more research as, for example, cultural issues, values, and government structures differ significantly from those in Europe.

Within the public sector, governmental agencies are critical for national EA projects as they participate in all of their phases. Consequently, understanding their role, what has happened, and why certain activities are taken become more important. However, only eight of the articles (11.27%) emerged from cooperation between academics and government agencies. This implies that the researchers remain somehow distant from the practitioners. This is also evident from the research methods usage (Table 10), as the researcher acting or participating within the practitioner community, such as by using ethnographic methods or observations, seems rare in the public sector EA studies. In contrast, most studies rely on interviews, surveys, and other informant-dependent methods. It should also be noted that GEA is often developed through the joint actions of researchers and practitioners, and later maintained by civil servants. This again emphasizes the need to incorporate practitioners and civil servants in the research endeavors, as they can better understand the root causes and causal relationships between actions, decisions, and consequences.

5.1 Recommendations for future work

There are some evident opportunities for further research on the public sector EA. First, our analysis (Figure 3) shows that current public sector EA research is topically scattered. Development aspects are emphasized, while implementation and adoption have gained less interest. This fragmentation becomes even more evident when the research themes are analyzed (Figure 4); frameworks and using EA are studied, while all other themes emerging from the literature have gained only sporadic interest. Given that EA research largely fails to
focus on problems regularly mentioned in the EA literature, such as governance structures, EA management, and security (Kaisler et al., 2005; Jan & Christine, 2014), future research is needed.

Second, although GEA has attracted interest from researchers, in practice the success of GEA is somehow limited. Consequently, questions relating to whether GEA is effective and needed can be asked. Furthermore, what is the impact of GEA in socio-economic terms? Is there any alternative GEA that would allow a country to better achieve its vision and strategy? What is the relationship between EA with other management approaches, such as COBIT, ITIL, or others? How is EA institutionalized in the public sector? What are the root causes of EA problems in the public sector (c.f. Dang & Pekkola, 2016a, 2016b)? These are potential questions for academics and practitioners to consider.

Third, GEA is typically first developed by researchers and practitioners, and later maintained by civil servants who usually lack skills in and knowledge of EA. Thus, government agencies may find themselves unable to monitor GEA and its progress, and to continue or maintain EA work. This means we need to study the roles taken up during GEA development, implementation, and adoption. Moreover, we have identified seven LoBs that the researchers have studied, including healthcare, statistics, immigration and naturalization services, digital preservation, road administration and state treasury, lands management, and social services. However, we cannot find clear evidence from the selected articles about whether the articles were targeted for some particular application of the EA approach. This would indeed be another topic for further research.

Finally, most GEA is deployed in the developed world, in countries that usually have a stable government and governance structures, sufficient resources, and high IT awareness and literacy. These factors can be considered prerequisites for GEA programs. Yet the situation is different in most developing countries. Therefore, we need more research on EA deployment in different settings and contexts, such as in developing countries that have to deal with frequent changes in their government structures, non-stable legal frameworks, a lack of necessary resources, and a low awareness of IT benefits.

5.2 Limitations
There are some limitations to this study. First, only articles in English were analyzed, so articles and the topics in other languages, such as German or French, were ignored, which may have biased the results. On the other hand, English is the de facto standard language in science, so the impact of articles in other languages on global public sector EA research would be minimal. Second, only eight online databases were included, which means we might have missed some articles published in journals or conferences not indexed in the selected databases (although scholar.google.com also complements other sources). Finally, our data collection period ended at the end of 2015, and articles published at the end of the year may not have been indexed by that point, and were thus excluded.

6. Conclusion
This paper reports the results of a systematic literature review on public sector EA. The 71 articles identified demonstrate the immaturity and early-phaseness of public sector EA research. Most articles still focus on development issues and frameworks, which, nevertheless, are essential to carry out EA work in different organizations. Yet very little is actually known about how those frameworks and practices are actually used and followed, how well they fit with their purposes, what the challenges are, and how different organizations, stakeholders, actors, employees, and citizens react. This calls for more research on implementation and adaption issues in an ever-increasing variety of organizations.

We also categorize public sector EA research into three groups: EA development, EA implementation, and EA adaptation. From these groups, we gathered insights by using qualitative analysis. The results show that the majority of the studies focus on EA development, specifically on frameworks and modeling. In contrast, the results suggest that future research may concentrate more on EA implementation from the perspective of interoperability and integration, and alignment and strategy, to gain an understanding of pragmatic problems. This will help governments and agencies form connected governments and reduce the number of fragmented business services.

Our contribution to the research is thus the illustration of the state of public sector EA research, and our offering of potential future research directions. We believe the results also help practitioners in understanding
what we, the researchers, know about an increasingly pervasive phenomenon with a significant practical impact, namely public sector EA research.

References


## Appendix A. List of selected study article, quality assessment and data

<table>
<thead>
<tr>
<th>#</th>
<th>Selected reference articles</th>
<th>Q-1</th>
<th>Q-2</th>
<th>Q-3</th>
<th>Q-4</th>
<th>SQ</th>
<th>TP</th>
<th>TM</th>
<th>CM</th>
<th>First author</th>
<th>GO</th>
<th>cited</th>
<th>Year</th>
<th>CR</th>
<th>MT</th>
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</thead>
<tbody>
<tr>
<td>A3</td>
<td>Bui. Q. Increasing the Relevance of Enterprise Architecture through “Citizenships” in U.S. State Governments. MIS Quarterly Executive. 2015. 14(4).</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>C3</td>
<td>S9</td>
<td>A</td>
<td>U.S.</td>
<td>ED</td>
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<td>2015</td>
<td>F</td>
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<td></td>
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<tr>
<td>A4</td>
<td>Tomas, F. and L. Larios. A Reference Requirements Set for Public Service Provision Enterprise Architectures. Software and Systems Modeling, 13(3), 2013.</td>
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<td>1</td>
<td>1</td>
<td>4</td>
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<td>S4</td>
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<td>ED</td>
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<td>G</td>
<td>T2</td>
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<td>A6</td>
<td>Shaanika, I., &amp; Iyamu, T. Developing Enterprise Architecture Skills: A Developing Country Perspective. Paper presented at the Key Competencies in ICT and Informatics. Implications and Issues for Educational Professionals and Management IFIP Advances in Information and Communication Technology. Volume 444. 2014. pp. 51-54.</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>C1</td>
<td>S10</td>
<td>A</td>
<td>Namibia</td>
<td>IN</td>
<td>0</td>
<td>2014</td>
<td>G</td>
<td>E2</td>
<td></td>
</tr>
<tr>
<td>A11</td>
<td>Zheng, T., &amp; Zheng, L. Examining e-government Enterprise Architecture Research in China: A Systematic Approach and Research</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>C1</td>
<td>S10</td>
<td>A</td>
<td>China</td>
<td>IN</td>
<td>5</td>
<td>2013</td>
<td>G</td>
<td>T2</td>
<td></td>
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<tr>
<td>#</td>
<td>Selected reference articles</td>
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<td>Q-2</td>
<td>Q-3</td>
<td>Q-4</td>
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<td>TM</td>
<td>CM</td>
<td>First author</td>
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<td>cited</td>
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<td>MT</td>
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<td>At-Hassawi, S. I. M. (2013). An Enterprise Architecture Mapping Approach for Realizing e-Government. Paper presented at the Third International Conference on Communications and Information Technology (ICICT 2013), Beirut.</td>
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<td>Valtosen, K., Sepänen, V., &amp; Leppänen, M. (2009). Government Enterprise Architecture Grid Adaptation in Finland, Proceedings of the 42nd Hawaii International Conference on System Sciences (HICSS-42) (pp. 128-135). Waikoloa, Big Island, Hawaii.</td>
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Research topics (TP): EA Development (C1); EA Implementation (C2); EA Adoption (C3); Overlapping (C4).

Research themes (TM): Interoperability and integration (S1); EA maturity (S2); EA alignment and strategy (S3); Framework (S4); Modeling (S5); Role of EA (S6); Developing EA (S7); Implementing EA (S8); Using EA (S9); General (S10).

Communities (CM): Academics and government employees (GA); Academics (A); Academics and enterprises (AE); Government employees (G).

Coverage (CR): General (G); International (T); Central government (C); Provincial/local/state/municipal (P); Line of business (L)

Method (MT): Theoretical framework building (T1); Critical literature Review (T2); Interview (E1); Survey (E2); Observation (E3); Secondary data (E4); Comparative studies (E5); Case studies (E6); Theoretical and practice integration (D1); Practice illustrations and introduction (D2); Viewpoints (D3); Prescriptive (P); Action design (AD).

Geography (GO): Authors from developed world (ED); developing countries (IN).
## Appendix B. Metadata themes within topic in EA research in public sector

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*Frameworks for Interoperability (FI); Business Architecture (BA); Framework for e-participation (FE); Evaluation Framework (EV); Framework in general (FG); EA framework in some specific context, such as data architecture, application architecture, technology architecture, and Identify Management Framework (FS).