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It is our great pleasure and privilege to welcome you to this special issue of the International Journal of Electronic Government Research (IJEGR). The central focus of this special issue is to address the “Scope, Objectives, and Achievements of E-government: E-government to E-governance.”

Having addressed the issues and set a long-term political vision to provide cost-effective and efficient services to citizens by reforming the public sector, President Clinton created the National Performance Review (NPR) in 1993. Different government agencies, consultants, private organizations, and policy makers worked together to set long term policies and strategies that would address this major reform. This resulted in the first phase of implementation of this revolutionary government system which we now call E-government (EG). After this first phase, national, state, and local governments from many developed countries – like Canada, Finland, Singapore, and the United Kingdom – also started to reform their administrative structures, processes, and regulatory frameworks by using modern ICT to set forth the preliminary phases of EG. EG can now be seen as a powerful, dynamic, and revolutionary approach for government administration, policy, strategy, and long-term state vision.

In the early stages of EG development, the gap between a government’s target and the actual country context was often very high. Governments in different countries might adopt an overly ambitious vision with little consideration of the complexity involved in bringing that vision to reality. EG is related to good governance, democracy, transparency, collaboration with the private sector, accountability, and increased citizen participation in public decision making. Therefore, because of the significant and far-reaching changes to the way governments deliver services in EG, successful implementation of EG must begin with an explicit vision, mission, and objectives. While many countries have begun to realize the benefits of launching EG, different countries have adopted their own different strategies to solve the problems associated with implementing EG.

EG is, in general, a more citizen-focused and public-private version of government. On the other hand, E-governance can evolve into participatory governance if it is supported by the appropriate principles, objectives, programs, and architectures associated with EG. Some researchers have argued that, according to epistemological and ontological paradigms, E-governance reflects the broader dimension of
the state-society relationship, which essentially includes the EG theme. A broader approach to EG embraces the whole range of governance and administrative projects. These need attention from a range of stakeholders, including researchers and policy makers. The aim of this special issue is to provide a common platform for discussion and presentation of original research highlighting issues related to scope, boundary, objectives, implementation, performance, barriers, and achievements of EG.

This special issue contains six papers which focus on different issues related to developing EG, its diffusion and adoption, the technological novelty of EG development, and the scope and challenges of user participation in E-government and E-governance. Integrating these concepts, this issue ultimately presents a comprehensive view of the mission, vision, and scope of EG development, socio-economic and technological refinement required for EG implementation, barriers to the achievement of EG objectives, strategies and scope for adopting EG, and the interoperability needed if seamless government service is to be enabled by EG applications.

The first paper by Kostas Ergazakis, Kostas Metaxiotis, and Tassos Tsitsanis “A State-of-The-Art Review of Applied Forms and Areas, Tools and Technologies for e-Participation” provides a good introduction to the notion of e-Participation and gives an overview of the different definitions of the term “e-Participation”. It also nicely summarizes the correlation between e-Participation and different tools and technologies. This paper presents a comprehensive overview of the e-Participation landscape, which it conceptualizes in a coherent and comprehensive way through a state-of-the-art review of the tools, technologies, and areas of e-Participation. This summary serves as a good one-stop kiosk for anyone who wishes to become acquainted with modern e-Participation tools.

The second paper by Teta Stamati and Drakoulis Martakos “Electronic Transformation of Local Government: An Exploratory Study” analyzes and identifies the critical success factors that enabled the employees of the central union of municipalities and communities of Greece to adopt the unified Local Government Access Framework (LGAF). In order to design appropriate EG systems, it is important to understand the many different issues related to the different levels of government (federal/national, provincial/state, and local/municipal). Other scholarly articles have confirmed that issues related to successful EG implementation, including institutional strengths and weaknesses, human resources, funding arrangements, local environments, technology absorption, and citizen acceptance and/or interest vary significantly, based on differences in the functions, objectives, and strategies of the various levels of government. This paper concentrates on the identification of the critical factors of EG adoption at the local level. The paper primarily uses the technology adoption model (TAM); however it also reviews behavioral, cognitive, and organizational issues in adopting EG, by integrating both concepts of technology adoption and adoption behavior. Consequently, a new conceptual framework for EG adoption by government employees at the local level extends TAM by offering additional factors critical for adoption. The framework can be used as a conceptual framework to determine the roadmap for adoption of an EG initiative.

The third paper “City E-Government: Scope and Its Realization” by Hanuv Mann, Gerald Grant, and Inder Jit Singh Mann aims to corroborate the presence of theoretical constructs of EG elements and services of major cities. The study involves analyzing EG initiatives taken by different local governments of different countries, with potential variance in E-governance scores. It is observed that different local governments develop their EG features based on local culture, organizational practice, and technological reformation. It reveals that the inherent scope of service provision by local government EG initiatives is unique. This finding gives rise to the understanding that customizing EG initiatives should ideally be oriented to the local needs of constituents.

The fourth paper “Organizational Development in Electronic Government Adoption: A
Process Development Perspective” by Bahar Movahedi, Ren-Xiang (Paul) Tan, and Kayvan Miri Lavassani addresses the development concepts of E-government from an organizational perspective. This paper utilizes the stage model and proposes a process based framework for analyzing EG adoption. The proposed EG development model can be employed for analyzing the practices and plans of future EG developments.

The fifth paper “Identifying Factors of Integration for an Interoperable Government Portal: A Study in Indian Context” by Rakhi Tripathi, M.P. Gupta and Jaijit Bhattacharya describes a very important issue in advanced EG development, which is the interoperability of EG. This is an important pre-condition for offering mature services and further ensuring integrated one stop government service. The integrated level of mature services refers to the situation in which government services are fully integrated (both vertically and horizontally). In this situation, different organizational structures, as well as their services and websites, are integrated. Citizens have access to a variety of services through a single portal, using a unique ID and password. All services can be accessed from the same web page and any transactions can be paid through a consolidated bill. In this mature stage, governments can undertake institutional and administrative reforms and develop a comprehensive view of service that fully employs the potential of ICT. The authors of this study, using evolutionary theory and different growth, stage, or maturity models, reveal necessary perspectives for the successful implementation of an interoperable technology based on process, communication, and data integration.

The sixth paper “The RFID Technology Adoption in e-Government: Issues and Challenges” by Ramaraj Palanisamy and Bhasker Mukerji illustrates some technological aspects articulated by modern EG services. This is an advanced study of EG reformation based on RFID technology, its applications, its technical issues and some related challenges. The paper is a comprehensive document on RFID concepts. It provides a general view of RFID applications and a review of related issues in EG and E-governance. It illustrates potential cases that developed countries should carefully consider in order to increase administrative effectiveness and efficiency in internal government operations. This paper represents an important advance for research on RFID applications in EG. More specifically, initiatives that reveal the factors influencing the adoption of RFID technology for public administration have the potential for successful development and proliferation of EG. This is because many different projects in the public sector currently use RFID technology to acquire information regarding the location and properties of entities that can be physically tagged.

It is our earnest hope that you will enjoy reading this special issue as much as we did during our review of the papers for this issue.

ACKNOWLEDGMENTS

We would like to thank Professor Vishanth Weerakkody, editor-in-chief of the International Journal of Electronic Government for giving us the opportunity and support to conduct the successful editing of this issue. We, the guest editors, have been impressed by the many scholarly articles we received in response to the call for papers for this special issue. All submissions were reviewed by at least two referees. Before responding with our final acceptance, we asked for two revisions. We gratefully acknowledge the support of the referees who reviewed the manuscripts and provided thoughtful suggestions for improving the quality of the papers.

Mahmud Akhter Shareef
Yogesh Kumar Dwivedi
Shantanu Dutta
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Guest Editors
IJEGR
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Norm Archer is Professor Emeritus in the Information Systems Area of the DeGroote School of Business, McMaster University, Canada. He is also Special Advisor to the McMaster eBusiness Research Centre (MeRC), which he founded in 1999 as its first director. From December 2000 to his retirement in July 2002 as a Full Professor, he held the Wayne C. Fox Chair in Business Innovation. He is currently involved in a variety of activities in research, consulting, teaching, and supervising graduate student research on eGovernment, eBusiness, and eHealth topics. He is extensively involved in the development and operation of the MSc program in eHealth, a unique collaborative program between the Faculties of Business, Health Sciences, and Engineering. Dr. Archer has published more than 100 papers in refereed journals and conferences, and has given many invited talks on eGovernment, eBusiness and eHealth at universities and conferences around the world. In his research he is active, along with his graduate students and colleagues, in the study of organizational problems relating to the implementation of eBusiness and eGovernment approaches, particularly pertaining to mobile applications in business, health, and government organizations, and the resulting impacts on processes, employees, customers, and suppliers. Current research projects involve various aspects of mobile eHealth, mobile government, identity theft, and change management in organizations.

Vinod Kumar is a Professor of Technology and Operations Management of the Sprott School of Business (Director of School, 1995–2005), Carleton University. He received his graduate education from the University of California, Berkeley and the University of Manitoba. Vinod is a well known expert sought in the field of technology and operations management. He has published over 150 papers in refereed journals and proceedings. He has won several Best Paper Awards in prestigious conferences, Scholarly Achievement Award of Carleton University for the academic years 1985–1986 and 1987–1988, and Research Achievement Award for the year 1993 and 2001. Vinod is a well known expert sought in the field of technology and operations management. He has consulted DND, CIDA, Canada Post, Industry Canada, CHEO, Federal partners of technology transfer and Canadian association of business incubator to name a few. Before joining academia in the early eighties, Vinod worked for five electronics and manufacturing firms for over 15 years in Canada, India and the U.S. in various line and staff management positions. Vinod has given invited lectures to professional and academic organizations in Australia, Brazil, China, Iran, and India among others. He has taught in Executive MBA programs in Canada and Hong Kong and in Sprott MBA in Ottawa, Iran and China where he enjoys connecting his industry and research experience with management theories.

Uma Kumar is a Full Professor of Management Science and Technology Management and Director of the Research Centre for Technology Management at Carleton University. She has published over 120 papers in journals and refereed proceedings. Ten papers have won best paper awards at prestigious conferences. She has won Carleton’s prestigious Research Achievement Award and, twice, the Scholarly Achievement Award. Recently, she won the teaching excellence award at the Carleton University. She has been the Director of Sprott School’s Graduate Programs. Uma has extensive consulting experience in both private and public sectors in India and Canada primarily working on technology incubation, technology transfer to developing countries and innovation.
management. She has consulted DND, CIDA, the Federal partners of technology transfer, and the Canadian association of business incubators. She has won Carleton’s prestigious Research Achievement Award and twice, the Scholarly Achievement Award. Recently she won the Faculty Teaching Excellence Award. Uma has taught in executive MBA program in Hong Kong and in Sprott MBA in Ottawa, Iran, and China. Over last twenty years, she has supervised more than 70 MBA, MMS and EMBA student’s projects; most of these projects dealt with real practical problems of organizations. She has also given invited lectures to academics and professionals in Brazil, China, Cuba and India.
A State-of-The-Art Review of Applied Forms and Areas, Tools and Technologies for e-Participation

Kostas Ergazakis, National Technical University of Athens, Greece
Kostas Metaxiotis, University of Piraeus, Greece
Tassos Tsitsanis, National Technical University of Athens, Greece

ABSTRACT

The concept of e-Participation is important for both citizens and decision makers. From the citizen’s perspective, e-Participation provides the opportunity to achieve and satisfy the need to be heard by politicians and participate in the decision-making and policy formulation processes through the use of ICT. On the other side, politicians are also able to promote and encourage public participation through communication channels with citizens and act in line with public opinion. During the past years, the e-Participation landscape has been growing and developed. Currently, there are many applied forms and areas of e-Participation. At the same time, there are a growing variety of tools and technologies that are available to enhance e-Participation. In this paper, the authors present a complete overview of the e-Participation landscape, through the state-of-the-art review of these tools, technologies and areas of e-Participation. This overview is of value to researchers and practitioners who want to have a knowledge base for further research and practical implementation in the wider field of e-Participation.

Keywords: Correlation, e-Participation, Technologies, Tools, State-of-the-Art

1. INTRODUCTION

Over the past ten years, internet and Information and Communication Technologies (ICT) in general, have made available a massive amount of information that is spread around the net rapidly and is continuously updated. Towards this direction, several communication channels have been developed in order to offer improved and increased access to high quality information (in various forms: text, audio, video, maps, etc), appealing to a wide range of audience of all ages and used in everyday basis by many the citizens. In addition to simple information provision, ICT, offer citizens the opportunity to interact among them, express opinions, participate in
communities sharing common interests, etc. In general, ICT is a powerful tool that can help increase social engagement of people, creating in this way a unique opportunity for achieving strong public participation in the decision making processes, through several e-Participation forms (Macintosh, Coleman, & Lalljee, 2005). However, the main raised question is: What e-Participation can really achieve?

E-Participation is very important for both citizens and decision makers (Macintosh, 2004, 2006a; Macintosh & Whyte, 2006). From the citizens’ perspective, e-Participation offers people the opportunity to achieve and satisfy a main need, the need to be heard by the politicians and interact with them (Adams, Haston, Gillespie, & Macintosh, 2003; Adams, Macintosh, & Johnston, 2005). The main characteristic of representative democracy is that citizens elect those politicians who share common ideas and interests with them, in order to participate on behalf of them in the decision making process (Tambouris, 2008). However, in real life, even political active citizens, they don’t often have the opportunity to discuss with politicians, and the expression of their opinion is limited in the narrow context of a simple political conversation with other citizens (Graber, 2002). Therefore, it is important for politicians to be involved in such conversations, so as to have access to various and diverse opinions and take them into account during the decision making process, increasing in this way, the involvement and participation of citizens in the overall political context (Malina & Macintosh, 2002).

2. General Context and Background of E-Participation

Nowadays, there are many applied forms and areas of e-Participation. At the same time, there is a constantly growing variety of respective tools and technologies that are available in order to enhance e-Participation. The main purpose of this paper is to present in a coherent and comprehensive way a complete picture of the e-Participation landscape, through the state-of-the-art review of these tools, technologies and areas of e-Participation. This overview should be of value to researchers and practitioners who wish to have a knowledge base for further research or for any kind of practical implementation, in the wider field of e-Participation.

In this respect, the next section provides a general context and background of the e-Participation field, presents the associated critical challenges as well as some methods to support and increase public participation through electronic means. Section 3 focuses on specific areas, where e-Participation is applied. Section 4 presents existing tools that are used for the enhancement of e-Participation, while section 5 presents technologies supporting e-Participation systems, in terms of information provision and retrieval. Section 6 presents the correlation between e-Participation areas and tools / technologies, and finally, section 7 summarizes the main conclusions and some future research challenges.
on several and different aspects of the two terms. Specifically, the United Nations study defines e-participation as “the use of the digital communications media which allow citizens to participate through a more inclusive, open, responsive and deliberative process, in policy making” (Ahmed, 2006, p. 2).

E-Democracy has as purpose to engage citizens to the decision making processes as well as to strengthen the representative democracy, using various channels of internet access, such as public and private PCs, mobile phones, handheld devices, interactive digital TV, etc. The democratic decision making processes can be distinguished into two main categories: the one is concerned with the electoral process and the other with citizens’ e-participation into the decision making (Macintosh, 2007).

A previous definition of the term (Hacker & van Dijk, 2000, p. 1), characterizes e-democracy as “a collection of attempts to practice democracy without the limits of time, space and other physical conditions, using ICT or CMC (Computer Mediated Communication) instead, as an addition, not a replacement for traditional ‘analogue’ political practices”.

A further analysis of the term can lead to three distinctive levels of e-Democracy: e-Democracy begins from a very narrow level, which is called the Local e-Democracy and occurs where citizens interact with each other by using ICT, to create small communities that share the same interests and exchange opinions through fora or other forms of online communication (Beynon-Davies, Owens, & Williams, 2003; Bruschi, Fovino, & Lanzi, 2005; Smith, Macintosh, & Whyte, 2006). However, this kind of e-Democracy does not offer the opportunity to interact with decision makers, since its overall goal is the communication among citizens, in order to pursue a common purpose or goal. A broader level of e-Democracy is the one called Internal e-Democracy and refers to the exploitation of ICT in order to improve internal democratic and decision making processes within a government, a political party or an organization (Dahlberg & Siapera, 2006). The scope of Internal e-Democracy is broadened when these improved democratic and decision making processes include citizens that communicate with elected representatives, thus creating a framework of direct and participative democracy instead of representative democracy. In this way, e-Democracy is extended to the broadest possible level and is called External e-Democracy.

Interpreting the above mentioned definitions of e-Democracy, an abstract definition occurs for e-Participation, which stresses the use of ICT in order to create new communication channels that ensure the participation of citizens to democratic and decision making processes (Moreno-Jimenez & Polasek, 2003; Whyte & Macintosh, 2003).

A study of OECD (OECD, 2001), provides the overall framework of ICT usage for supporting online participation of citizens and stresses the overarching objectives of e-Participation, which are summarized in the following directions:

1. Reach a wider audience, to enable broader participation.
2. Support participation through a range of technologies to cater for the diverse technical and communicative skills of citizens.
3. Provide relevant information in a format that is more accessible and understandable by the target audience, in order to enable more informed contributions.
4. Engage with a wider audience to enable deeper contributions and support deliberative debate.

Towards achieving these objectives, several actions should be undertaken focusing on:

- The encouragement of decision makers and public authorities to consider the ways in which they can use e-participation tools to enhance democracy and to develop strategies for implementing e-participation tools where relevant and necessary.
- The exploitation of already accumulated knowledge and experience in the e-partic-
ipation field, having as main purpose the citizens’ benefit.

- The development of new tools based on Web 2.0 technologies, for the enhancement and effective support of democratic decision making processes.
- The sustainability of citizens’ e-participation and the reinforcement of public engagement to democratic processes.

Rating the importance of e-Participation objectives, the important role of information provision for enabling more informed contributions by citizens and other stakeholders, should be stressed. Content provision can be embedded in any form of e-participation, creating a pyramid that correlates the range of public participation to the degree that information is provided through e-participation tools, in terms of repositories or information exchange between users. An indicative pyramid, including a small number of such e-Participation tools is presented in Figure 1.

The need to achieve the overarching e-Participation objectives, as set above, combined with the experience that has been gained over the last years from the research in the e-Participation field, create a set of challenges and barriers (Smith, & Macintosh, 2007):

1. Social Challenges and Barriers
2. Political Challenges and Barriers
3. Organizational Challenges and Barriers
4. Technological Challenges and Barriers
5. User Engagement

Some methods to support and increase public participation through electronic means, are mentioned by Coleman and Grotze (2001):

- Access to balanced information.
- An open agenda.
- Time to consider issues expansively.
- Freedom from manipulation or coercion.
- A rule-based framework for discussion.
- Participation by an inclusive sample of citizens.
- Scope for free interaction between participants
- Recognition of differences among participants, but rejection of status-based prejudice.

According to OECD (2001, 2003) there are three key factors for consideration when seeking to use ICT for online citizen engagement, namely: Timing, Tailoring and Integration.

Timing refers to the development of tools that support user engagement to each stage of e-participation processes. Until now, only few countries have developed tools that offer citizens the opportunity to participate in more than one stages of the decision making process. In most cases however, citizens only participate in the

Figure 1. The e-participation pyramid
first stages of the decision making process and not in the final stages, where the most important decisions regarding the concerned issue are made.

Tailoring, deals with the development of generic e-participation tools that can be easily customized and adapted, in order to meet the expectations and requirements of public bodies with different agendas and different policy orientation. For example, local governments deal with a considerably smaller audience than national governments, while their agenda includes small scale issues and problems compared to the large scale issues that have to be faced by a national government.

Finally, integration of new online methods with traditional methods, seems to be more effective than e-participation or traditional participation standing alone (Downey & Fenton, 2003). When trying to engage the highest possible number of users, it is important to find ways to combine these two fields, in order to provide information and receive feedback from citizens that have different interests, skills, knowledge and background. This section has provided a general overview, context and background of the e-Participation field (views, definitions, associated terms), by also presenting the associated objectives, critical challenges as well as some methods to support and increase public participation through electronic means. Given that the main purpose of the paper is to present a complete picture of the e-participation landscape, the next section presents the specific areas, where e-participation is applied.

3. APPLIED FORMS AND AREAS OF E-PARTICIPATION

In this section, the focus is on the specific areas that e-Participation is applied, in order to enhance the highest possible engagement and involvement of citizens. The categorization is based on previous research activities conducted by the DEMO-net Excellence Network on e-Participation (available at: www.demo-net.org):

Consultation

Consultation is a two way relationship between citizens and decision makers, the main characteristic of which is that citizens provide feedback to the information made available to them by the decision makers. The overall process of consultation is managed by a public authority, which provides the appropriate information to citizens regarding the issues that are set for consultation, defines a set of questions that need to be answered and, finally, identifies the roles of every stakeholder in the consultation process. The citizens’ role in this process is to provide decision makers with their opinions and comments on the issue set for consultation. Citizens can respond interactively, submit online comments and they also have the opportunity to contribute to the consultation with arguments supported by information using online resources like data repositories, RSS feeds and online databases related to the issues of the consultation (Braak, Oostendorp, Prakken, & Vreeswijk, 2006).

Deliberation

Deliberation expands the limits of an online discussion and opinion exchange, regarding important policy issues. ICT offer the opportunity to citizens to be involved, at a high degree, in a deliberation process and actively participate in the decision making, especially in the initial stages of the deliberation procedure (e.g. for the preparation of a law). However, at the latest stages, their role becomes less important, as their participation is usually confined to posting opinions and comments to a discussion that is moderated by domain specialists, legal experts and public officers.

The deliberation process creates a new quality for a modern e-democracy. Electronic deliberation addresses the following important issues:

- It creates a new framework for decision making and legislation formation, based on wide-range public participation.
It reinforces the trust of people to political institutions, due to the establishment of transparent decision making processes.

Through deliberation, people are better informed, having access to useful and qualitative information, and they can contribute with more informed opinions and arguments. In addition, the opinion exchange can bring into light several aspects of an issue, helping to better understand the complete parameters of a problem.

Through a deliberation process, a common phenomenon is the creation of citizen communities with common interests and ideas, that create a common opinion and support this with very strong and well formulated arguments, empowering in such a way the opinion they express.

### Polling

ePolling is the process that uses ICT in order to conduct surveys and measure the public’s opinion in a variety of topics. ePolling uses surveys that target a sample of the population that has been chosen in a scientific and statistical way (Bruschi et al., 2005). These surveys are conducted through a series of questions, which end to the extrapolation of generalities in ratio or within confidence intervals. ePolling systems are usually characterized by less stringent security requirements, in relation to eVoting. In particular, they can tolerate errors affecting a small percentage of votes, without compromising the final result. The main actors and characteristics of an e-polling process include: the voters which are the stakeholders that are interested in voting on a specific issue; the polling collector, which usually is a public authority that is responsible for collecting and counting the votes submitted over the process; the party that secures the validity and the transparency of the process; the authentication protocols for the identification of the identity of the voters; and the votes certificates that clarify the eligibility of a voter to participate in the polling process.

### Voting

ICT play an important and vital role over the e-voting process as they support the right of citizens to vote and elect their representatives. e-Voting, however, is a very generic term, as it spreads over a wide range of individual subjects that constitute the voting procedure and extend from the automatic counting of votes, to the use of mobile phones or other forms of technology that give the citizens the ability to authenticate themselves and vote. In any case, e-Voting highly contributes to the participation of citizens, as it offers the opportunity to elderly and disabled persons to participate to the elections procedure by improving accessibility with the use of ICT (Kampitaki, Tambouris, & Tarabanis, 2008; Xenakis, & Macintosh, 2004a, 2004b).

### Campaigning

E-Campaigning (or e-Advocacy) deals with the organization of a campaign strategy and the achievement of its goals, by using web tools familiar to most of the internet users. An e-Campaign has clear and measurable goals, targets a specific audience, uses the web and new media in order to approach the targeted audience and aims to create supporters’ groups via the development and adoption of a simple and attractive message or quote. A specific form of e-Campaigning used by politicians and political parties in order to gain the support of citizens in the elections procedure, is e-Electioneering (Baringhorst, 2009).

### Electioneering

Electioneering is the political campaign including activities directed towards the electorate from the part of the candidates, whose main aim is to be elected. Electioneering uses a wide range of communication tools like posters, flyers, speeches, audio and video for spreading the candidates’ messages and persuading the public to vote for them. When ICT are used in the process of electioneering, the term is transformed to e-Electioneering. Candidates
tend to use internet and new media in order to establish new communication channels with voters and spread their messages and opinions to a wider range of citizens. It is considered as the future of the electioneering process, since a strong internet communication strategy and presence may be of critical importance for the final result (Lusoli, 2005).

Petitioning

Petitioning is a way in which citizens can express their opinions and views about issues that concern them. A petition is a formal request to a higher authority, signed by a number of citizens. The right of the subject to petition has been exercised since Saxon times. It was mentioned in the Magna Carta and more explicitly in an Act of 1406. In an era of restricted political rights, the public petition was an important avenue for those who had no parliamentary representation to have their complaints heard. Until recently, the impact of petitions had diminished because public complaints could also be brought to the attention of members through the media. However, with the increasing emphasis on e-Democracy, the impact of petitions is starting to be felt again.

An e-Petition is a petition that has gathered support electronically. E-Petitions allow to petitioners to provide background information on the petition, encourage discussion around the issue so as to help inform those who are interested in signing and those receiving the e-Petition. An e-Petition service forms another channel for the petitioning process and, thus, an online record of e-Petitions can be created and act as an online hub for petitioning information. An e-Petitioning service does not imply any differences in existing constitutional or internal processes. It enables citizens and policy makers to see how petitions are processed in general. e-Petitions have the potential to become an effective tool in creating a constant dialogue between citizens and decision / policy makers and in adding value to the existing democratic, representative structures (Mosca, & Santucci, 2009).

Decision Making

Participation and especially e-Participation is a very critical parameter to a decision making process. Every decision making process produces a final choice among several alternatives, intending this one to be the best solution of a pointed problem. For this reason, all the stakeholders who are being affected by the problem, should participate in the decision-making process by providing useful information, expressing personal opinions and generally contributing with all means. ICT ensure the highest possible participation to this process.

Service Delivery

This area of e-Participation is strongly related with e-Government level 4 and 5 electronic services, which are fully completed via internet, without requiring the citizen’s physical presence. It has to do with the transaction stage, where the citizen participates actively in order to achieve his desirable purpose. The strong bond between e-Government and e-Participation is totally understood, since the bigger number of services provided via Internet, the bigger number of citizens will participate (Fraser et al., 2003).

Spatial Planning

ICT is used for the development of systems that can be a strong decision making tool for spatial planning, especially in regions that are of environmental interest. The use of GIS systems, or other technologies like Google Maps or Google Earth, accompanied and connected with useful information, regarding laws, directives and regional authorities’ decisions may create a powerful e-participation tool. This tool can aim to the resolution of conflicts between opposing sides, in an automated and fast way as well as to the transparency that can be ensured through spatial planning procedures.
Information Provision

Information provision is a critical parameter of any e-Participation system, as the main scope of an e-Participation process is to create informed participants that can contribute with opinions that are supported by strong arguments, which can be formulated only if a person has deep knowledge of the issue under discussion. That is the reason why information must be well-structured, accurate, legible and immediately related to the corresponding issue. A well informed user should be stimulated in order to actively share his opinion.

Mediation

Mediation, in a broad sense, is consisting of a cognitive process of reconciling mutually interdependent, opposed terms as what one could loosely call “an interpretation” or “an understanding of”. Mediation is a form of alternative dispute resolution or “appropriate dispute resolution”, aiming to assist two (or more) disputants in reaching an agreement. The parties themselves determine the conditions of any reached settlements - rather than accepting something imposed by a third party. The disputes may involve: states, organizations, communities, individuals or other representatives with a vested interest in the outcome.

In terms of e-Participation, mediators use appropriate techniques - tools and/or skills to initiate and improve dialogue among disputants, aiming to help the parties reach an agreement on the disputed matter. Normally, all parties must view the mediator as impartial. e-Participation systems and tools act usually as mediator among the disputants, in order to achieve a dispute resolution that satisfies all the parties involved in the process.

Community Building

Community building is a field where ICT gives the opportunity to citizens to formulate communities that have a special common characteristic. These communities either share common interests or stem from specific distinct domains such as regional communities, religious communities, political communities, social communities etc. Community building is the core element of social networking. A representative example is Facebook, where users come together and create groups with the same hobbies, views, likes and dislikes and in such a way they make their voice sound louder. This is a way to recruit more supporters and make citizens more active and much more aware of issues that are of their interest, through interacting with other people and sharing opinions with absolute freedom and without manipulation from power holders.

This section has presented an overview of all the areas of application of e-Participation. However, it is also important to present all the available tools that are commonly used, in order to enhance e-Participation. These tools are thoroughly presented in the next section of the paper.

4. TOOLS FOR ENHANCING E-PARTICIPATION

The development of systems that are used for e-Participation purposes is based on the exploitation of already existing tools that allow users to interact with each other in various ways. Even if these tools cannot be directly characterized as e-Participation tools, however, due to the fact that they concentrate a large number of users within their operation, they can be easily called e-Participation Enhancement Tools.

Chat Rooms

Chat rooms are web applications for virtual communication between users sharing common interests. Chat rooms enable two-way communication in terms of sending and receiving messages in real time. These messages are available to all the users that are connected at the time to the particular chat room. Apart from messages, chat rooms such as Yahoo, use both text and voice simultaneously. The oldest form of true chat rooms is the text-based variety. Nowadays, the most popular of this kind is the Internet Relay Chat (IRC). There are also...
graphical user interface text-based chat rooms which allow users to select an identifying icon and modify the look of their chat environment. Chats conducted for e-Participation purposes are offered for a limited time-horizon, normally an hour at most.

**Blogs**

A ‘blog’ or ‘weblog’ is a shared online journal where people can post diary entries about their personal experiences, hobbies, and interests. Blogs invite comments from their readership on each post and are very easy to populate. According to Herring et al., blogs are the latest genre of internet communication to attain widespread popularity, yet their characteristics have not been systematically described (Herring, Scheidt, Bonus, & Wright, 2004).

A weblog is often used for communicating personal opinions and widespread information instead of sending a large number of e-mails, or trying to find another way to approach potential supporters of this opinion. Blogs are useful tools for power holders that create a new channel of communication with citizens, in order to share opinions, activities and initiatives.

Blogs could be characterized as interesting management tools, as well, due to the fact that managers can get information about what is going on in their organization. On the other hand, the staff can get information about the management board’s activities.

Finally, blogs are excellent dissemination tools, as for example, a committee can post the minutes of a meeting, a manager can post the next steps of a project or the project status and keep in touch with the rest of the project team members.

Blogs are closely connected to information provision and especially this kind of information that sometimes cannot be provided directly by an organization. The provision of such information can create a general feeling to the citizens/ recipients, that they can influence opinion or decision making on a specific issue. This, maybe, could be characterized as the most important role of weblogs in the overall democratic and decision making process.

**Online Fora**

Fora or discussion boards are web applications that allow the online discussion among users that share common interests, views, hobbies or are members of political parties, civic groups and communities of any kind. A forum allows users to exchange messages or comment on messages of other users. Fora are very often moderated, which means that users have to accept the terms of use of a forum and their messages should be compatible to them in order not to be bowdlerized. An online discussion, using a forum, begins with an initial thread in which users reply on messages or post new messages, creating in such a way a rolling dialogue. A specific form of online fora is the structured fora, that offer users the functionality to post for or against an opinion, resulting in a discussion map that provides an overview of the discussion, shows the opinions that gained general acceptance and can be used as a very good decision making tool.

**ePetitions**

ePetitions are online tools that are mostly used by public administrations or organizations as a mean of pressure towards decision makers. ePetitions are not interactive but collective tools that call people to support for or rally against an issue of their interest by signing the petition so as to collect a significant number of signatures. ePetitioning tools vary form case to case, giving or not advanced functionalities to users, such as discussion capabilities and information provision in various forms (Beddie, Macintosh, & Malina, 2001; Finnimore, 2008; Iacopini, 2007; Whyte, Renton, & Macintosh, 2005). The most important aspect of an e-petition is its wide dissemination, in order to gather as many as possible voters, since the quantity of votes is the real objective of such a procedure. ePetition tools, as well as, e-voting and e-polling tools, should be characterized by
the use of a strict user authentication protocol, in
order to avoid multiple voting, which can affect
a petition’s validity.

ePanels

ePanels make use of other e-participation tools
such as discussion forums, deliberative polling
tools, expert online chats, e-Petitioning and e-
consultation tools, in order to bring participants
together in a time-specific debate. Participants
are usually recruited, which means that not
everybody can participate in a debate, but
only persons having expertise in the discussed
issue. Participation in e-panels is measured
in terms of users attending the debate, which
can prove to be a problem-solving process if
it is well organized and if it provides easy to
understand information. In addition, ePanels
can be constituted not only of domain experts
but also of a representative sample of citizens
and decision makers.

eVoting

eVoting is a term encompassing several differ-
ent types of voting, embracing both electronic
means of casting a vote and electronic means of
counting votes. eVoting systems for electorates
have been used for over fifty years, debuting
with the use of punch cards. Over the years, the
evolution in e-Voting brought the use of optical
scan voting systems which allow a computer
to count a voter’s mark on a ballot. Internet
based voting systems have gained popularity
and have been used for government elections
and referendums in several countries. eVoting
systems tend to be very popular, as they simplify
and speed up a process that used to disengage
people to participate in the representative
democracy. However, e-voting processes seem to
be vulnerable from risks that have to do with user
authentication, multiple voting and electoral
frauds (Xenakis & Macintosh, 2004c, 2004d).

ePolls

ePolls or quick polls are internet based instant
or short time surveys which collect the public
opinion via interviewing a random sample of
people on a specific question with a simple
yes/no answers. They also allow participants
to select one answer from a list of alternatives
in response to a simple statement of question.
ePolls are mostly used as an unofficial tool
for gathering initial opinions, that are going
to be used as information in an official deci-
sion making process. Quick polls, due to their
immediate nature and low cost, offer easy to
analyze and understand results and are used in
a wide range. The only disadvantage of such
tools is that there is no way to stop voters from
participating more than once, as no authentica-
tion mechanisms are used. Finally, polls provide
participants the opportunity to view real time
results of the survey, just a few moments after
they have submitted their vote.

eCommunities

The latest trend in e-Participation systems deals
with portals that enhance eParticipation through
community building tools and especially social
networks. Social networks are very popular
among citizens and especially among young
people. They find a means to express opinions
and communicate to each other, in a way far
from the strict and official environment of other
e-Participation systems. These eCommunities
are created by users that share common
interests and opinions. By using new media
and several other small scale applications,
they try to further advance the dialogue on the
issue they participate in. The most famous and
widespread tool, referring to the construction
of electronic communities, is Facebook, which
is a social network that engages a large number
of users and deals with several issues, creating
in such a way a new culture in public and in
e-participation. This culture shows the power
of citizens when gathering together and trying
to promote participation towards a common
objective. Facebook is an illustrative example
of tools that aim to create e-Communities and
social structures made of nodes, that are tied
by one or more specific types of interdepen-
dency, such as: values, visions, ideas, financial
exchange, friendship, sexual relationships, kinship, dislike, conflict or trade.

**Decision Making Tools**

The main objective of eParticipation, is the engagement of citizens for contributing and support power holders in the decision making process. Apart from other forms of eParticipation, the development of decision making tools and especially decision making games, seems to be more effective for citizens’ engagement, more familiar and pleasant when used by citizens. Decision making games give users the chance to interact with each other through graphic animation environments, that illustrate and simulate relevant aspects of an issue. Decision making games, can make use of other applications that are well known and successful among citizens, such as famous online games or business administration tools, for achieving their purposes. For example, the SimCity game can be a useful tool that can be deployed in a discussion about spatial planning. FEED project, which is funded under the e-Participation 2007 call, is an excellent paradigm of embedding the philosophy of SimCity in the decision making process for issues concerning spatial planning and its consequences for the environment.

**Web-Casting Tools**

Web-casting tools make use of media technologies in order to distribute media files over the Internet, either live or on-demand. Webcasts use streaming media technology to capture content from a single source and make it available online to the public who are interested in listening or viewing this specific information. Web-casting tools are mostly used, in terms of e-participation, for broadcasting meetings of local, regional or national councils and give citizens the opportunity to be better informed about issues of their interest without requiring their on-site presence in the place that the meeting takes place. However, web-casting tools, do not provide the opportunity to citizens to interact with each other, as they cannot be used for web conferencing purposes.

**eConsultation Tools**

Several public authorities make use of various eParticipation tools in order to create an e-Consultation environment and simulate the Consultation process through internet. eConsultation tools are fora and blogs that provide information to citizens in multiple ways, to enhance their active participation in a discussion about emerging and public interest issues (Whyte & Macintosh, 2002). Information is provided either in a “traditional way” referring to documents, articles, laws and in general static repositories of data managed by the public authority, or in a “dynamic” way using RSS feeds, webcasts and new media.

In what follows, the most important technologies which support eParticipation systems, in terms of information provision and retrieval, are presented.

5. TECHNOLOGIES APPLIED FOR ENHANCING E-PARTICIPATION

Except for tools that can be directly connected with public participation and can be characterized as e-Participation tools, there is a group of tools and technologies acting in assistance of e-Participation systems in order to support them in terms of information provision and retrieval. These technologies and tools are briefly described in the following sections which summarize the functionality they provide to the users of e-Participation systems and how assist them to be more informed and contribute with well-documented arguments to the overall decision-making process.

**Geographic Information Systems**

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

In a more generic sense, GIS applications are tools that allow users to create interactive queries (user created searches), analyze spatial
information, edit data, maps, and present the results of all these operations.

GIS software is distinguished into the following categories:

- Desktop GIS are used to create, edit, manage, analyze and display geographic data. They are sometimes classified into three functionality categories: GIS Viewer, GIS Editor and GIS Analyst.
- Spatial database management systems (Spatial DBMS) are used to store the data, but often also provide analysis and data manipulation functionality.
- WebMap Servers are used to distribute maps over the Internet (see also for the Open Geospatial Consortium standards: WFS and WMS).
- Server GIS provide basically the same functionality as desktop GIS but allow to access this functionality via networks (so-called geoprocessing).
- WebGIS Clients are used for data display and in order to access analysis and query functionality from Server GIS over the internet or intranet. Usually, there is a distinction between Thin and Thick client. Thin clients (e.g. a web browser used to display Google maps) provide only display and query functionality, while Thick clients (e.g. Google Earth or a Desktop GIS) provide often additional tools for data editing, analysis and display.
- Libraries and Extensions provide additional functionality that is not part of the basic GIS software because it may be not needed by the average user. Such additional functions can cover tools for terrain analysis (e.g. SEXTANTE), tools to read specific data formats (e.g. GDAL and OGR), or tools for the cartographic display of geographic data (e.g. PROJ4).
- Mobile GIS are used for data collection in the field.

In terms of e-participation, GIS tools are often used for spatial planning (Carver et al., 2001) where the interconnection of maps with laws, documents, directives and initiatives can be used for the resolution of conflicts and the support of the decision making process.

**Podcasts**

A podcast is a series of audio or video digital media files which is distributed over the Internet by syndicated download, through Web feeds, to portable media players and personal computers. Although the same content may also be made available by direct download or streaming, a podcast is distinguished from most other digital media formats by its ability to be syndicated, subscribed to, and downloaded automatically when new content is added. Like the term broadcast, podcast can refer either to the series of content itself or to the method by which it is syndicated. The main purpose of podcasting is information provision. High bandwidth is required if the user wishes to download a number of podcasts and a suitable device capable of replaying the content, such as an iPod.

**Online Surveys**

An eSurvey is very useful when conducted in parallel with the execution of an e-Consultation procedure. eSurveys are usually short series of questions, that call the user to answer using tick boxes or combo boxes, based on material that has been provided by a public authority during consultation on a specific issue. Surveys are commonly implemented in a number of close-ended questions, with ordered response categories, and some open-ended ones.

**Argument Visualization Tools**

Argument Visualization Tools are software tools that support the construction and visualization of arguments in various representation formats, for instance, graphs or tables. Typically, these tools produce “box and arrow” diagrams in which premises and conclusions are formulated as statements (Braak et al., 2006). These are represented by nodes that can be joined by lines to display inferences. Arrows are used to indicate their direction.
Newsgroups

A newsgroup is a repository usually within an e-Participation system, for messages posted from many users in different locations. The term may be confusing to some people, because it is usually a discussion group. Newsgroups are technically distinct from - but functionally similar to - discussion forums on the World Wide Web. Newsreader software is used to read newsgroups.

Mailing Lists

A mailing list is a collection of names and addresses used by an individual or an organization to send material to multiple recipients. The term is often extended to include the people subscribed to such a list, so the group of subscribers is referred to as “the mailing list”, or simply “the list”.

Mailing list is simply a list of e-mail addresses of people that are interested in the same subject, who are members of the same work group, or who are taking class together. When a member of the list sends a note to the group’s special address, the e-mail is broadcast to all of the members of the list. The key advantage of a mailing list over approaches such as web-based discussion, is that when a new message becomes available, it is immediately delivered to the participants’ mailboxes.

Wikis

Wikis are applications in the web that allow user to view content that has been submitted by other users, edit this content, add more content, or comment on it. Wikis are collaborative platforms where users with common interests are cooperating in order to produce the best possible result. For example, Wikipedia is a workspace (collaborative encyclopaedia, in particular) where users work together in order to offer high quality information to the visitors of the web platform and conserve the validity of the particular web page.

The main characteristic of wikis is that they are extremely user friendly work spaces and do not require important IT background to allow users collaborate. In addition, wikis are step by step applications that, based on the cooperation of the users during a continuous and ongoing process, target to achieve the best possible result.

Most wikis offer at least a title search, and sometimes a full-text search. Alternatively, external search engines such as Google, can sometimes be used on wikis in order to obtain more precise results.

Search Engines

Search engines are online applications that assist users to find and retrieve information from the web, relevant to the keywords they have selected and they are interested in. Search engines differ one from another in terms of the searching functions, searching details, range of search and rating of the findings. There are engines that search all over the web for the desired results, such as Google and Yahoo and engines that are search-specific, finding and retrieving information and content from particular repositories or web sites.

Search engines can be divided into dynamic and static. Static engines offer the user the opportunity to search in repositories, databases and content tanks that contain information that are closely related to a specific issue, for example environmental issues discussed over a deliberation procedure. Dynamic engines use user defined keywords, to retrieve and present information gathered from all over the web. This information is continuously updated, keeping users in touch with the latest news on the issue they are interested in.

The results of the search may be documents, pictures, videos, audio, articles, web sites etc and are presented in a structured way, according to the criteria and the algorithm used by the search engine.

eNewsletters

Newsletters are publications about one main topic that are distributed to a targeted group of recipients, mostly used for dissemination and
marketing reasons. Electronic newsletters in particular, are distributed via mailing lists or presented through websites and are considered as one of the most effective solutions for informing people that are interested in a particular topic and have declared their interest by registering in an online newsletter delivery application.

Alerts

Alerts are used in complementary with e-Mails and RSS feeds in order to inform citizens and stakeholders about upcoming events or recently received news. Alerts help people to stay up to date, by participating in events that suit their profile and may be of their interest. In addition, alerts allow to people to receive news that enrich their knowledge on a specific topic, by providing to them the latest information and advancements on it.

Frequently Asked Questions

Frequently Asked Questions, or FAQs are listed questions and answers, all supposed to be frequently asked in some context, and pertaining to a particular topic. Depending on usage, the term may refer specifically to a single frequently asked question, or to an assembled list of many questions and their answers.

Concerning e-participation, FAQs aim to render participation of a system’s users easier and help them overcome any difficulties they meet, so as to become active participants.

Natural Language Processing Tools

Natural language processing (NLP) is a field of computer science concerned with the interactions between computers and human (natural) languages. Natural language generation systems convert information from computer databases into readable human language. Natural language understanding systems convert samples of human language into more formal representations, that are easier for computer programs to manipulate.

Other Tools

The aforementioned tools tend to be the most popular in terms of support provided to users of e-Participation systems. However, the development of e-Participation systems is based on and uses a wide range of sub-systems and modules that are described below:

- Ontology Management Tools
- Semantic Annotation Tools
- Workflow Management Tools
- Customer Relationship Management Tools
- Content Management Tools
- Web Portals
- Content Analysis Tools
- Process Management Tools
- Web Service Interface
- Office Automation Tools

6. CORRELATION OF RESULTS

In the previous sections, the majority of e-Participation areas as well as the respective tools that are used to enhance e-Participation, have been presented. However, in practice, it is noticed that some tools are more often used for specific e-participation areas, since they have been proved to be more efficient and effective for these areas. Based on such observations, Table 1 indicates and summarizes the correlation between e-participation areas and e-Participation tools. The sign √ shows a strong correlation between an e-Participation tool or a supporting tool and a specific e-Participation area. It should be mentioned that this table has been elaborated by the authors, based on the combination of existing e-Participation practices’ review as well as of authors’ practical experience and involvement in e-Participation projects.

7. CONCLUSION

Over the past ten years, several communication channels have been developed, offering to citizens improved and increased access to high
Table 1. Correlations between e-participation areas and tools

<table>
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quality information, appealing to a wide range of audience of all ages and used in everyday basis by most of the citizens. In addition to information, ICT, give citizens the opportunity to interact with each other, express opinions and participate in communities with common interests. In general, ICT can be a powerful tool that helps to increase social engagement of citizens, thus creating a unique opportunity for achieving high public participation in the decision making process.

The concept of e-Participation is very important for both citizens and decision makers. From the citizen’s perspective, e-Participation provides to people the opportunity to achieve and satisfy the need to be heard by politicians and interact with them as well as to participate in the decision making and policy formulation processes. Politicians, on the other side, shall promote and encourage public participation in order to be capable to create communication channels with citizens. Currently, there is a great variety of applied forms and areas of e-Participation. At the same time, there is also a constantly growing variety of tools and technologies that are available in order to enhance e-Participation.

In this respect, the purpose of this paper has been to present a complete overview of the e-Participation landscape, through the state-of-the-art review of these tools, technologies and areas of e-Participation.

This review covers the majority, if not all, the applied forms and areas of e-Participation and respective tools and technologies. Based on this review, useful conclusions have been also drown up regarding the correlation between e-participation areas and e-Participation tools.

REFERENCES


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Electronic Transformation of Local Government: An Exploratory Study

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ABSTRACT

The paper examines the critical success factors for employees’ adoption of the unified Local Government Access Framework (LGAF), deployed for the Central Union of Municipalities and Communities of Greece. Following an extensive bibliographical survey, an initial conceptual framework (CF1) based on the Technology Acceptance Model (TAM) for LGAF adoption is proposed, which is empirically explored within sixteen Local Governments Organizations. The CF1 is revised using the structured-case approach. New concepts discovered during each research cycle revealed that LGAF adoption is a procedure of experiential judgement. The applicability of the TAM is investigated and the model is enhanced, exploring additional variables that affect perceived ease of use, perceived usefulness and actual use. A final complementary CF2 is presented and the evaluation of this model according to the data received from the case studies is discussed.

Keywords: E-Government Acceptance, E-Technology Acceptance Model, Government Diffusion, Interpretive Approach, Local Government Organizations, Structured-Case Method, Theory of Reasoned Action, Transformational Government

INTRODUCTION

Local Government Organizations (LGOs) hold a respectful share in contributing to economic growth and wealth of societies (Irani et al., 2005). Beyond the core administrative and democratic activities, health, education and security are among the service branches adding public value and creating the right environment for prosperous economies. The local government structures are believed to be the essence of participatory democracy. It is through local government that citizens come into direct contact with their elected government, as the power flows from national to local government (Koussouris et al., 2008). Thus, LGOs desks are in many countries an active point of transactions between the government and the citizens.

The Greek National Public Administration System is constituted of a large number of LGOs. Particularly, there are more than one thousand LGOs, mostly municipalities that provide a significant number of governmental services to the citizens, visitors, enterprises based within their geographical limits and other governmental bodies. The exact number of services...
provided by each LGO varies as they have their own operational framework that depends on parameters related to the distinctiveness of each one. Such parameters can be the financial status, the local population composition, region’s cultural characteristics, geopolitical and geographical attributes and other organizational and legal parameters that allow or not the LGO to offer some kinds of services (Koussouris et al., 2008). These services can be split in general categories according to their nature and entity they refer to. Some indicative categories refer to payments, applications, registries, records, certificates and licenses.

LGOs’ services were, until recently, provided in a conventional way, which meant that no infrastructure had been developed for electronic services and proved the poor level of Information and Communications Technologies (ICT) adoption. The conventional way of services provision demanded the physical presence of the person that applied for the service in the LGO. Thus the interested person went in a LGO to submit both the application and get the outcome of the requested service (Koussouris et al., 2008). The poor level of ICT adoption by the LGOs was the main reason behind the aforementioned situation and did not allow the electronic provision of services.

Given the importance of services offered by LGOs, it is essential, in the modern technological era, for ICTs to provide solutions in order to transform these traditionally offered services into electronic transactions. These can be initiated over the Internet aiming at the facilitation of the citizen’s life, who is the eventual ‘customer’ of any government. LGOs service branches need to keep pace with innovation and technology developments, thus guaranteeing a lasting quality and provision of public services. The great potential of ICTs to contribute to a competitive and wealthy economy needs to be exploited in LGOs activities. Only through investment in ICT research and effective innovation concepts can the local public administration ensure an innovative, knowledge-enabled, and competitive economy.

The recent trend towards local transformational government has emerged mainly by the expressed aspirations of citizens who are placing new demands on local governments regarding the performance and efficiency, proper accountability and public trust, and a renewed focus on delivering better services and results. Thus, LGOs attempt to re-establish their mission critical operations and this has lead to persistent organizational transformations. Given this fact, currently an important number of the European regions, prefectures, and municipalities have constructed their own presence on the web. In Greece, the situation also seems to be changing recently, as many LGOs are attempting to develop their web presence, by implementing projects mainly funded by the 6th Framework Program and the Greek Information Society. These are aiming to achieve the goal of providing better services, creating new conditions for social activation and improving the communication with the citizens. Through their online presence, many Greek LGOs have also started offering various categories of online services as introduced by Moon (2002) regarding information, interaction and transaction. Modern ICTs heavily impact and shape these activities for cooperating and interacting with stakeholders within country and sometimes across borders. ICTs are changing local government structures and organizational processes producing significant business and technical benefits (Heeks, 1999). Electronic projects are becoming increasingly important for the public administration, and LGOs base their decision to move forward with modern e-platforms expecting benefits such as better services, operational savings and increased program effectiveness (Gil-Garcia et al., 2007).

Although LGOs have travailed to embrace ICTs, these individual attempts resulted frequently in isolated, ad-hoc systems, offering only a part of the services, mainly dissemination of information or at best communication in two ways. Up to now Greek local government structures have not been able to live up to expectations, as they are generally characterized
by indolence of service delivery and failure to attract users’ participation. The problem is mainly attributed to lack of capacity and technical know-how. Some analysts argue that the local government ‘mayhem’ has to do with the lack of a secure, privacy-aware, interoperable, scalable, and high-administrative unified framework (Karantjias et al., 2010a). Unambiguously, as the connectivity generated by the Internet is opening new opportunities in service delivery, an integrated local government access framework can be a valid solution in providing value-adding services.

This paper reports on the findings of the use of the structured-case approach to investigate the success factors for a massive Greek e-government initiative that affects the users’ adoption and diffusion process. The authors were involved in the whole life cycle development process of the project, including design, implementation and system roll out. A total of sixteen case studies were conducted in Greek LGOs in order to investigate the parameters that ensure the smooth use of the Local Government Access Framework (LGAF). The paper also outlines the contribution of the structured-case approach to build e-government theories according to the interpretivist approach (Walsham, 1995; Yin, 2003; Remenyi, 1998; Denzin & Lincoln, 1998; Hussey & Hussey, 1997; Lee & Baskerville, 2003; Myers, 1997; Orlikowski & Baroudi, 1991; Oates, 2006). To this point, the research shows that the structured-case approach proves the linkage between the data collected and the conclusions drawn, through the process of knowledge and theory building.

**MOTIVATION FOR THE STUDY**

Although the engineering world appears today more mature than ever in providing stable technology premises in order to build real interoperable and secure systems (Chetty & Coetzee, 2009) for LGOs, enterprise information architects still struggle to define fundamental principles, strategies and policies in designing large-scale, scalable, extensible and high-administrative local government solutions (Karantjias et al., 2010b).

The adoption of the unified LGAF (LGAF project, 2007) in Greek LGOs has many implications for digital innovations. By establishing a LGO-wide standard, adoption of the LGAF creates incentives to invest in electronic content, and potential to link the LGAF with other ICT applications within local government structures. LGAF reshapes access to information by integrating almost two hundred and fifty electronic government services in many different domains of the public administration such as in health, social care, education, public transportation, cultural, and other sectors (LGAF project, 2007). Along with these implications, there are also some organizational and technological constraints on the diffusion of LGAF from the perspective of the social shaping of technology. To this point, some studies emphasize that the evolutionary path of the systems is not predetermined by the systems’ technological inner logic or economic imperative, but is rather affected by social, organizational, and cultural factors that surround the systems (Fulk, 1993; Fulk, Schmitz, & Steinfield, 1990; Kling, 2000; Williams & Edge, 1996).

The LGAF is a Greek/European co-funded initiative project, deployed for the Central Union of Municipalities and Communities of Greece (www.kedke.gr). It aims to bring together the central government, the local government, the private sector, and the society by providing advanced, secure, privacy-aware, interoperable, and high-administrative national electronic services. The motivation of Greek local administration organizations to reduce administrative costs, as well as to enhance the services they offer, has been the main driving force for the development and implementation of the LGAF framework as a mission critical broadband e-government infrastructure within Greece. Thus, LGAF facilitates LGOs to revitalize their operations and make local administration more proactive, efficient, transparent and service oriented. To
accomplish this transformation, Greek LGOs are planning to intensively use the LGAF in order to introduce innovations in their organizational structures, practices, capacities, and mobilize, deploy and utilize the human capital and information, technological and financial resources for service delivery to their constituents.

Despite the popularity of web based systems in the local public administration, research on the individual-level factors that influence LGOs and employees’ acceptance of e-government initiative has rarely been conducted. Most studies on the adoption of Internet-based technologies in local government administration have largely focused on citizens’ use rather than LGOs’ employees use, even though employees also play a critical role in the diffusion dynamics of e-government systems. For example, individual employees’ perceptions of e-government systems and prior experience may promote or discourage willingness to adopt and may facilitate or restrain use and diffusion of such systems.

Furthermore, few empirical studies have attempted to build a theoretical model that explains the factors that influence technology adoption and use. Given that there is an accumulation of a considerable amount of diffusion research in new technologies, it is surprising that few theoretical models have gone beyond profiling users’ characteristics with regard to the adoption of new technologies.

Thus, the goals of this study are twofold: firstly to understand the factors that affect employees’ adoption and on going usage of a local government access framework, and secondly to suggest a conceptual model that explains the dynamics of employees and acceptance of the unified framework. An investigation of employees’ perception toward an integrated e-government system for LGOs will help provide a rich background and build a theory of e-government system acceptance, and further enlighten the process of technology adoption and use specifically in the context of local government administration.

TECHNOLOGY ACCEPTANCE THEORY

Examining why people accept or reject new technologies has been one of the most challenging issues in the study of information systems (Swanson, 1988). Among the various efforts to understand the process of user acceptance of a new innovation, the Technology Acceptance Model, introduced by Davis (1986), is one of the most well established theoretical frameworks that describes how users accept and use a technology. The model attempts both to explain the key factors of user acceptance of information systems and to predict the importance of the factors in the diffusion of technological systems (Davis et al., 1989). The model is trying to derive the determinants of computer acceptance that is general, capable of explaining user behaviour across a broad range of end-user computing and systems technologies, while is trying to be parsimonious and theoretically justified (Davis et al., 1989).

The TAM is exploring the factors that affect behavioural intention to use information systems and suggests a linkage between the key variables, namely, perceived usefulness and perceived ease of use and users’ attitude, behavioural intention, and actual system adoption and use (Davis, 1986). According to TAM, perceived usefulness (PU) and perceived ease of use (PEOU) influence one’s attitude towards system usage, which influences one’s behavioural intention to use a system, which in turn, determines actual system usage (Davis et al., 1989).

PU is defined as “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989), and PEOU as “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989). PEOU is predicted to influence PU, because the easier a system is to use, the more useful it can be (Davis, 1989). System acceptance will suffer if users do not perceive a system as useful and easy to use (Davis, 1989).
As Figure 1 illustrates, the TAM is a path model that begins with the impact of external factors. These can be system design characteristics, user characteristics, task characteristics, nature of the development or implementation process, political influences, organizational structure, and so on (Ajzen & Fishbein, 1980; Irani et al., 2005). The TAM suggests that information system usage is determined by behavioral intention, which is viewed as being jointly determined by the user’s attitude toward using the system and the PU of the system (Davis et al., 1989).

TAM is based on the Theory of Reasoned Action (TRA), according to which beliefs influence intentions, and intentions influence one’s actions (Ajzen & Fishbein, 1972). TRA, introduced by Martin Fishbein and Icek Ajzen (1975, 1980), is derived from previous research that started out as the theory of attitude, which led to the study of attitude and behaviour. TRA stresses that individual behaviour is driven by behavioural intentions, where behavioural intentions are a function of an individual’s attitude toward the behaviour and subjective norms (Ajzen & Fishbein, 1972). Attitude toward the behaviour is defined as the individual’s feelings about performing the behaviour (Ajzen & Fishbein, 1972). It is designated through an evaluation of one’s beliefs regarding the consequences arising from a behaviour and an evaluation of the desirability of these consequences (Ajzen & Fishbein, 1972). Thus, overall attitude can be assessed as the sum of the individual consequence multiplied by the desirability assessments, for all expected consequences of the behaviour. Subjective norm is defined as an individual’s perception of whether people important to the individual think the behaviour should be performed (Ajzen & Fishbein, 1972). The contribution of the opinion of any given referent is weighted by the motivation that an individual has to comply with the wishes of that referent. Hence, overall subjective norm can be expressed as the sum of the individual perception multiplied by the motivation assessments, for all relevant referents.

Since Davis’ (1986) introduction of the TAM, many studies have been conducted using it in a number of systems usages, testing its appropriateness and modifying it in different contexts. Past research on the model has largely focused on personal computer usage or relatively simple software applications (Chau, 1996; Davis, 1993; Davis et al., 1989; Mathieson, 1991). Recently, in line with the development of web-based technologies, applications of the TAM have been made in the areas of organizational contexts (Hu et al., 1999; Venkatsh, 1999), e-commerce (Jiang et al., 2000) and digital library systems (Davies, 1997).

**RESEARCH METHOD AND CASE DESCRIPTION**

Although TAM is a well established and documented model for explaining technology acceptance by users, the model has been unable to account comprehensively for the factors that affect users’ acceptance of technology systems, due to the original model’s intended generality and simplicity. The main TAM’s drawback is its lack of explicit inclusion of predecessor variables that influence PEOU and PU (Dishaw...
Strong, 1999; Irani et al., 2005). Davis (1989) also claimed that further research should explore other variables that could affect PEOU, PU and actual use. Thus, it is necessary to further investigate the users’ acceptance of technology systems with additional constructs considering the specific technology adoption contexts.

One of the most important stages in this research was choosing the appropriate research philosophy, approach and method for the empirical inquiry. The research approach that was followed is an interpretive one (Walsham, 1995; Yin, 2003; Remenyi, 1998; Denzin & Lincoln, 1998; Hussey & Hussey, 1997; Lee & Baskerville, 2003; Myers, 1997; Orlikowski & Baroudi, 1991; Oates, 2006). The research focused on the key issues and challenges that might restrict the adoption of LGAF. In the spirit of the interpretivist school, the approach throughout the study was to understand e-government adoption and to build a new theory, rather than to test established theories. This was achieved by studying a number of existing theories and adoption perspectives as different theoretical lenses through which a complex phenomenon might be viewed.

Considering the aforementioned, the authors adopt a methodological approach based on theory and experience about the adoption process of e-government and proceed to propose an effective holistic model for LGOs e-government that considers technical, human, social, legal and organizational parameters. The research that has been undertaken involves a series of case studies to sixteen LGOs by means of the structured-case research method (Carroll et al., 1998; Carroll & SWATMAN, 2000), which has been widely used to extend knowledge about the way that government structures evaluate their e-government projects in order to actually use them. The application of the structured-case approach assures scientific rigor that is otherwise inadequate in information systems case study research (Irani et al., 2005).

The structured-case approach provides a focused but flexible methodological approach to the field research process, through the following (Irani et al., 2005).

- Outcomes integration allowing theory, knowledge and practice to emerge from the data collected;
- Researchers guidance to follow and ensure accuracy; and
- Ability to record the processes of knowledge and theory-building.

The structured-case method targets to build theory, which has the form of “a system of interconnected ideas that condense and organise knowledge” (Neuman, 1991). The method attempts to explain, predict and provide understanding (Irani et al., 2005) determining the relationships between concepts in order to build a ‘web of meaning’ with respect to various issues of users’ adoption (Carroll & SWATMAN, 2000; Irani et al., 2005). The development of conceptual frameworks namely, CF1, CF2. CFn is used to present the process of obtaining knowledge and theory building where CFn is the latest version of the theory built. The theory building process is interrelated with practice (Carroll et al., 1998; Carroll & SWATMAN, 2000). Applied research can lead to theory building, which can lead to further field research and theory building (Irani et al., 2005). Thus, each research cycle can lead to changes to the existing CF. As part of the hermeneutic circle each new CF expresses the pre-understanding for the next cycle (Gummerson, 1998) following the natural human action of interpretation and world understanding (Carroll et al., 1998; Irani et al., 2005). Essentially, a spiral towards understanding is enacted as current knowledge and theory foundations for yet another research cycle, which will enhance, revise or evaluate the research understanding. This is particularly appropriate for information systems, as it is an area distinguished by rapid changes, which suggests the need for theory and practice to become closely intertwined (Galliers, 1997). The structured-case will enable theory to be developed that will reflect the concerns, problems and issues facing local government structures (Carroll & SWATMAN, 2000; Irani et al., 2005).
Conceptual Framework (CF1)

The initial CF1, which is depicted in Figure 2, has been derived from the literature, the practitioners’ insights, and the authors’ experiences. As mentioned previously, the limited research undertaken regarding LGOs’ employees adoption of e-government systems enforced the authors to use as baseline the TAM in order to develop the initial CF1.

The model integrates constructs from various fields such as information systems, sociology, and public administration. The model is more comprehensive and field specific than the individual theoretical models, and attempts to capture the complex relationships involved in e-government adoption and diffusion. Apart from the main TAM’s two constituent, PU and PEOU, as noted in Figure 2, the adoption of e-government in LGOs raises important political, cultural, organizational, technological, human and social issues that must be considered and treated carefully by any LGO contemplating its adoption. The first conceptual model is based on the hypotheses in Table 1.

The theoretical propositions mentioned in the Table 1 are shortly described as follows:

**Perceived Ease of Use:** Significant field research has taken place the past two decades regarding the effects that the construct PEOU has on both PU and intention to use (Davis et al., 1989; Hu et al., 1999; Venkatesh, 1999). Considering this, the authors assume that PEOU will have a positive effect on both PU and behavioral intention to keep using LGAF.

**Perceived Usefulness:** Considerable theoretical and empirical research work has proved that individual behavioral intention to use an information system is strongly affected by users’ PU (Davis et al., 1989; Hu et al., 1999; Jackson et al., 1997; Venkatesh, 1999). The authors consider very likely that high employees’ PU will lead them to positive evaluation of the necessity of LGAF.

**Perceived Motivation:** Additionally to PEOU and PU, potential individual differences in motivation to use a technological innovation were suggested to be one of the most relevant variables in the adoption and use of e-government systems (Hong et al., 2002). Past studies that have investigated the role of motivation in Internet use also confirm that motivation has a positive impact on new technology adoption and diffusion (Stafford & Stern, 2002). Active use of new technology with greater motivation has been found to produce stronger behavioral effects on the use of it (Rubin, 2002).

**Compliance with LGO’s Policy:** Worth mentioned methodological approaches identify the impacts of contextual social factors such as political influences, organizational structure, and social interactions and relationships (Ajzen & Fishbein, 1980; Davis et al., 1989). The authors suggest that LGO’s policy can establish communication channels that may either promote employees’ adoption and use of the system, or induce resistance from them. However, previous research work highlights that in some cases is hard to impose in a top down manner a technology innovation in an organization (Dutton et al., 2004) and this may lead to a short term use. We should consider employees as the primary users and most critical decision makers about the acceptance and use of a new information system. Whether employees decide to use LGAF from their own will, or due to LGO’s policy, this construct can be an important factor in the diffusion process of the e-government system in the local governmental context.

**Perceived Compatibility:** According to Roger (1995) who introduced the Diffusion of Innovation (DOI) theory, perceived compatibility refers to “the degree to which an innovation is seen to be compatible with existing values, beliefs, experiences, and needs of adopters”. Authors consider
Table 1. Hypotheses

<table>
<thead>
<tr>
<th>Model Construct</th>
<th>Hypothesis</th>
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<tbody>
<tr>
<td>H1a-Perceived Ease of Use</td>
<td>Higher levels of perceived ease of use will be positively related to higher levels of perceived usefulness of LGAF</td>
</tr>
<tr>
<td>H1b-Perceived Ease of Use</td>
<td>Higher levels of perceived ease of use will be positively related to higher levels of intention to use LGAF</td>
</tr>
<tr>
<td>H2-Perceived Usefulness</td>
<td>Higher levels of perceived usefulness will be positively related to higher levels of intention to use LGAF</td>
</tr>
<tr>
<td>H3a-Perceived Motivation</td>
<td>Higher levels of motivation will be positively related to higher levels of perceived ease of use of LGAF</td>
</tr>
<tr>
<td>H3b-Perceived Motivation</td>
<td>Higher levels of motivation will be positively related to higher levels of perceived usefulness of LGAF</td>
</tr>
<tr>
<td>H3c-Perceived Motivation</td>
<td>Higher levels of motivation will be positively related to higher levels of intention to use LGAF</td>
</tr>
<tr>
<td>H4 - LGO Policy</td>
<td>Higher levels of compliance with LGO’s policy will be positively related to higher levels of intention to use LGAF</td>
</tr>
<tr>
<td>H5a-Perceived Relative Advantage</td>
<td>Higher levels of perceived relative advantage will be positively related to higher levels of perceived usefulness of LGAF</td>
</tr>
<tr>
<td>H5b-Perceived Relative Advantage</td>
<td>Higher levels of perceived relative advantage will be positively related to higher levels of intention to use LGAF</td>
</tr>
<tr>
<td>H6-Perceived Compatibility</td>
<td>Higher levels of perceived compatibility will be positively related to higher levels of intention to use LGAF</td>
</tr>
<tr>
<td>H7-Perceived Trustworthiness</td>
<td>Higher levels of trustworthiness will be positively related to higher levels of intention to use LGAF</td>
</tr>
<tr>
<td>H8-Perceived Complexity</td>
<td>Lower levels of SW complexity will be positively related to higher levels of perceived ease of use of LGAF</td>
</tr>
</tbody>
</table>
as an important proposition the fact that higher levels of perceived compatibility are associated with increased intentions to adopt the e-government initiative. Users will be more willing to use online services if these services are congruent with the way they like to interact with others (Carter & Bélanger, 2005).

**Complexity:** Complexity may be considered to be comparable to TAM’s perceived ease of use, and is defined as “the degree to which an innovation is seen by the potential adopter as being relative difficult to use and understand” (Roger, 1995). The initial conceptual approach considers that perceived lower complexity of the proposed e-government system can facilitate indirect users’ behavioral intention to keep using the system.

**Relative Advantage:** In the description of the DOI theory, Roger (1995) defines relative advantage as “the degree to which an innovation is seen as being superior to its predecessor”. In addition to PEOU and PU, adopter’s perceived relative advantage to use technology systems was found to be one of the most relevant variables in the successful diffusion of information systems (Carter & Bélanger, 2005). Thus, the authors hypothesize that perceived relative advantage can be positively related both to perceived usefulness and intention to use.

**Trustworthiness:** Perceived trustworthiness is considered as a significant construct in the initial conceptual framework CF1. Trustworthiness can be further divided in two main sub-constructs namely, trust to the initiative and trust to the LGO. Bélanger et al. (2002) define trustworthiness as “the perception of confidence in the electronic marketer’s reliability and integrity”. Users must have confidence in both the government and the enabling technologies (Carter & Bélanger, 2005). Thus, the hypothesis made by the authors, expresses that higher levels of perceived trustworthiness are positively related to intention to use LGAF. Past studies indicate that trust of the technological innovations is a significant predictor of e-government adoption (Carter & Bélanger, 2005). Considering the perceptions of trustworthiness of the internet technologies, users that perceive the reliability and security of the internet to be low will be less likely to adopt e-government. LGOs’ consistency in technological systems can reassure users that e-government is both safe and beneficial. Considering the perceptions of trustworthiness of LGOs, users that perceive the LGO to be more trustworthy will be more likely to adopt e-government (Carter & Bélanger, 2005). Components of trustworthiness identified in previous work on e-commerce, such as integrity and competence (McKnight et al., 2002), can be considered as starting points for LGOs to act on. For instance, LGOs must convey to users that LGOs have both the desire and ability to support e-government information systems designed to meet citizens’ needs.

### Methodological Approach of the Research Cycle

The first research cycle aimed to validate and further revise the proposed initial conceptual framework CF1. The case studies took place in sixteen LGOs that participated in the project as ‘pilots’ LGOs. The data collection procedure followed the major prescriptions given by most textbooks in doing fieldwork research (Irani et al., 2005). A variety of secondary data sources, such as internal reports for LGOs operations and requirements and technical reports for standards and specifications, were used to collect data regarding the development of e-government systems. All in all, a number of data sources, as noted in Figure 3, were used to derive the findings presented herein. These included workshops, interviews, observations, illustrative materials such as newsletters and other publications of the LOGs’, and various project documentation. The authors’ extensive...
business experience in information systems projects, especially for the public sector, along with a predefined interview protocol were used to determine the data needed for the research.

More than seventy in number, regional and national interviews, were conducted with the LGOs Heads, the Chief Technology Officers, the Administrators, the Project Managers, the Consultants, and the general supporting staff at LGO-level. The duration of each interview was approximately forty minutes, and every interview was conducted on a one-to-one basis, so as to stimulate conversation and breakdown any barriers that could otherwise have hindered the knowledge transfer between the interviewer and the interviewee. The authors acted as a neutral medium through which questions and answers were exchanged and therefore endeavoured to eliminate bias. Interviewers’ prior extensive experience helped in avoiding any bias in interviews, which mainly occurs when the interviewer tries to adjust the wording of the question to fit the desired answer, or records only selected portions of the respondent’s answer. Interviewers did not use follow-up questions in order to elaborate on ambiguous or incomplete answers. In trying to clarify the respondent’s answers, the interviewers were really careful not to introduce any ideas that could form part of the respondent’s subsequent answer. The interviewers were mindful of the feedback respondents gained from their verbal and non-verbal reactions. As a result, the interviewers avoided giving overt signals, such as smiling and nodding approvingly, when respondents failed to answer a question.

A two-day workshop took place in four different places around Greece with the participation of experts from the LGOs, the Greek Ministry of Interior and the ICT industry. This way, consultants and the academia worked together in collecting all the business and technical information needed. Protocols of procedures were defined beforehand in order to guide the group discussion and to document the LGAF acceptance scenario elements. Based on the workshops and the online consultation inputs, the project consortium and the authors synthesized a set of key factors that LGOs consider as important for the LGAF acceptance and use. Afterwards, a set of requirements for the effective design and implementation of LGAF were consolidated as the first user scenarios. These covered the most important issues identified, taking into account existing inventories, policies, initiatives, and the national legal and regulatory framework in Greece. This set of scenarios was the main input to the next phases of LGAF implementation (analysis, design, and implementation).

The LGAF consortium attempted as well to identify and stimulate the different perspectives of the Greek LGOs’ operations, in order to better predict and shape the innovation processes required in the design of an acceptable e-government system. These formed a coherent set of visions and archetypal images of scenarios, which recorded the situation in the handling of government status documents, and identified complementary and/or contrasting alternatives and problematic areas. Issues existing between different levels of government (national, regional, and local) were analysed properly, and regional differences that occur due to distinct cultures, diversing local constitutions, and organizational structures were identified.

During this attempt the concept of community of interest was introduced. Organizing e-government services into communities, aimed to reduce the overhead of operating them in small, medium, and big LGOs. Communities are themselves services, created, advertised, discovered, and invoked mostly as web services. In the synthesis of the final scenarios and assessment matrices, each issue that was identified and extracted, was tagged with its origin. Moreover, it gained a topic of interest or a dimension, and it was grouped into a specific category. The gap analysis performed on the conducted categories by adopting accepted methodologies, such as ‘Soft Systems Methodology (SSM) (Checkland & Scholes, 1999), ‘SWOT analysis’ methodology (Harvard Business Press, 2009), and ‘ITPSM’ methodology (Heeks, 1999), allowed us to better identify and validate the differences between the current state of affairs, and a future desired state of LGOs.
FINDINGS AND DISCUSSION

The outcomes from the data analysis of the sixteen case studies demonstrate that e-government adoption and diffusion research agenda is influenced by a combination of social, technological and organizational issues at both LGO and individual employees level. Thus, a multi-disciplinary approach is essential to the investigation and research of e-government adoption phenomenon especially in LGOs. This must involve an effective management of systems, information, policies, processes, and change. Afterall, the technology quite often proves to be a source of problematic issues rather than the solution. To this point, debates during the workshops were about the fit of technology on LGOs’ processes and operations rather that developing the right technology.

Some of the variables identified in the CF1 were found to be inter-reliant. The authors followed the classification of e-government terminology described by Irani et al. (2007) and attempted to group the findings as Human and Social Constructs, Organizational Constructs and Technical Constructs, allowing for more specific concepts to emerge within such groupings. In the following paragraphs we use the aforementioned grouping to present our findings—and grounds for future discussions—having as basis the initial proposed framework. Additionally, in the final paragraph a new, revised conceptual Framework, CF2, is proposed.

Human and Social Constructs of the Conceptual Framework

The construct of compatibility was found to have a significant relationship with use intentions in the context of e-government. During the workshops the participants strongly suggested that LGAF should operate in a manner that “is consistent with individuals’ values, beliefs and experiences” and provide information and work support in a manner that is “consistent with what employees are used to within LGO environment”. For instance, non-paper forms should be similar to paper forms that employees are familiar with. Compatibility may be achieved by LGOs agreeing to standard interfaces and consistent workflows. Authors enforced employees’ involvement in the e-government ini-
tiative in order to achieve such standardization. By making interfaces and interactions between the sites similar across LGOs, compatibility was enhanced.

Another significant concern revealed from the data analysis process was the construct of trustworthiness. With respect to perceptions of trustworthiness in technology innovations, employees, who perceived the reliability and security of the internet to be low, presented obstacles in using LGAF. According to McKnight et al. (2002) in initial relationships, “people use whatever information they have, such as perceptions of a web site, to make trust inferences”. Indeed, there was a long debate between participants in the workshops regarding the notion of initial trust to LGAF that refers to “trust in an unfamiliar trustee, a relationship in which the actors do not yet have credible, meaningful information about, or affective bonds with, each other” (McKnight et al., 2002). With respect to the perceptions of trustworthiness in LGOs’ mission, employees who perceived Greek government to be trustworthy consider the introduction of LGAF in LGOs as a welcome initiative. The analysis of the data, gathered from interviews, demonstrated that LGO-based trust was mainly associated with an employee’s perceptions of the organizational environment, such as the structures, regulations and legislation that make an employee feel safe and trustworthy. Discussions between LGOs representatives revolved around the ensuring privacy through access control mechanisms and work documents security. The decision to engage in e-government transactions required employees to trust the technology through which electronic transactions were to be executed (Lee & Turban, 2001).

Another important construct that authors identified, especially throughout the workshops, was the motivation or the perceived need for working ‘over the wire’. In demographic terms, the data analysis revealed that LGAF adopters differed from non-adopters as being younger, ambitious, more educated, and often with higher incomes. Additionally, early LGAF adopters had a more multinational profile with a greater desire to satisfy various communication needs, and were more interested in experimenting with new technologies. This indicated that individual demographic characteristics were also influencing the adoption of e-government services. The cases analysis proved that a group of employees were more likely to keep using LGAF than others. Consequently, we examined two factors namely, the level of prior Internet usage and the employees innovativeness. Individual innovativeness can be defined as ‘consumer acceptance’ of new ideas (Irani et al., 2005). The findings of the empirical study supported the notion that higher Internet usage led to LGAF adoption. Domain-specific innovativeness, i.e. innovation linked to certain domains rather than as a personality characteristic, was found to influence LGAF adoption.

Finally, there was a group of employees that was persuaded very quickly of the LGAF’s significant advantages compared to prior institutional systems. This proved that individual perceived relative advantage enforced the individual intention to use.

Organizational Constructs of the Conceptual Framework

The discussions raised a significant number of organizational issues for local organizational structures. These issues concerned the coordination and ownership between and across LGOs and departments, the political engagement regarding the delivery of technology supported services, the LGO capacity including available resources (human, technical, etc.), change and risk management issues as well as the appropriate legal and legislation framework.

Participants discussed about the nature and mission of LGOs and their relationship with the electronic services provided. There was a clear concern regarding potential future developments and change. As Irani et al (2005) mention in their research agenda “the only constant feature in any e-government-related service is constant change”. Clear policies for LGOs was seen to be critical. Among the key issues, related to the policy-making process,
were the following: sense of ownership and the required organisational transformation. There was a main concern about the employees’ engagement in the LGOs political processes. There was a long discussion as to how the political processes affect the everyday work. Participants also questioned the fact that local and central government used, up to a point, the e-government agenda as a means to pursue their own political ends. A key concern was about the way to cope with organisational inertia. A particularly important area of risk was identified as the access to e-government services and the associated issue of community inclusion. Learning from e-government experiences in terms of knowledge management and organisational learning was identified as another key theme. Because of the large amount of information at the core of every e-government service, the need for effective and efficient knowledge management arose in one form or another in all of the workshops. Specifically, the issue of transferring knowledge from one context to another was deemed important. Also, in a significant number of interviews and in all the workshops, it emerged that measurement and evaluation techniques were necessary in order to realise the aforementioned learning, organisational and managerial perspectives of e-government. In particular, the need to understand social value, identified within the Human and Social Constructs, was an important prerequisite to establishing appropriate evaluation strategies.

Similarly in order to achieve successful e-government implementations, the necessity of establishing a coherent legitimacy was strongly mentioned. It emerged that the Greek state must carefully consider prerequisites for establishing relationships of trust between government and citizens. The legal aspects must become part of the e-government national roadmap, strategies, and long-term objectives. There was agreement that the legal framework regarding the provision of electronic services ‘are still in infancy’. Thus, a cohesive legal framework is definitely required in order to speed the adoption of e-services. During LGAF the main domains of concern identified included the ‘Back-Office’ re-organisation, the inclusive access, the trust and confidence, and the better use of public sector information. Therefore, four main sets of legislation are considered relevant: Personal data protection laws; Privacy and security laws; Information (provision) laws; and Administrative laws in national and international level.

Technical Constructs of the Conceptual Framework

The data retrieving process revealed various issues regarding technical parameters that might affect LGAF adoption and regular use. The general supporting staff in LGOs stressed the need for a framework less complex and more user-friendly regarding i.e. its user interface, the incorporation of forms and templates that employees used previously, etc. The reduction of time it takes to complete a specific work was also considered to be a necessity in the target e-government environment. A worth mentioned percentage of the interviewers and participants in the workshops had a genuine anxiety about the use of innovative technological tools. This attribute was more intense especially with aged employees and the authors decided to call this attribute ‘computer anxiety’.

More technical staff of LGOs identified the need for flexible and scalable technology, privacy and security, shared services and common identity management, standards, coordination and integration between LGOs operations and departments, identification and authentication. The notions of scalability and flexibility of e-government systems are often well cited across the literature (Irani et al. 2007). The cases revealed that there is a need to create flexible systems that can adapt and change on demand. The changing nature of e-government also means that accessibility versus information security is an important issue (Irani et al., 2007). There was no definite agreement regarding the issue of what constitutes valid and appropriate access to information within e-government. The issue of how shared operations can be managed was another theme in this area. Multiple facets of this problem were discussed, ranging from
purely technical, such as the management of databases, to organisational such as the implications to LGO’s structure. Debates about shared data and appropriate access also demonstrated the issues of privacy and security and identification and authentication. Another technological theme in all LGOs was the issue of interoperability and standardisation. The concerns were revolving around the way that different LGO’s departments can be managed, the technical tools needed for integration and the standardisation of certain data and services. The notions of open standards and open source software were also highlighted. In general, interviewees and workshop participants were confused regarding the complexity and the consequences of such developments, and stressed the need for further investigation on their impact. Finally, some important issues were raised regarding the roles and the education needed for working in the new electronic environment.

Conceptual Framework (CF2)

The findings presented in the paragraphs above, resulted in the modification of the initial CF1. The revised framework, CF2, is depicted in Figure 4.

The proposed CF2 is not some kind of magic tool; it can rather be used as the basis for further research. The adoption of LGAF from LGOs is presented as the initial crucial step in the diffusion process in order for LGOs to capture their goals, enable an environment for social and economic growth and contribute to the process of transformation of the Greek local administration towards a leaner and more cost-effective administration. The wide adoption of LGAF facilitates communication and improves the coordination of public authorities at different tiers of government and LGOs up to the departmental level. Further, LGAF enhances the speed and efficiency of operations by streamlining processes, lowering costs, improving research capabilities and improving documentation and record-keeping. The real benefit of LGAF lies not in the use of technological framework per se, but in its application to processes of transformation in the Greek bureaucratic public sector.

Both from the perspective of practitioners and from an academic point of view, LGAF represents an essential change in the Greek public sector structure, values, beliefs, culture and the ways of conducting work. In the LGAF initiative, the transformational efforts encompass all the major organisational dimensions including strategy, structure, people, technology and processes as well as the principal external forces such as citizens, suppliers, partners and regulators. As the introduction of LGAF is representing a fundamental change, resistance to change from LGO’s employees was anticipated. The main reasons behind resistance to change were the lack of skills to use the new platform; the lack of employees’ motivation; employees did not understand the relative advantage of the ‘big picture’ and the redefinition of the organisational structures and the power distribution. The authors realized that individual employees did not really resist to the change but rather they were resisting to the loss of status, loss of pay, and loss of comfort.

CONCLUSION

Greek government is introducing e-government as a means of reducing costs, improving services and increasing effectiveness and efficiency. Thus, e-government initiatives have been identified as one of the top central government priorities.

The introduction of LGAF results in organizational change, as well as change in the employees’ way of work. The employees’ acceptance of LGAF raises important political, cultural, organisational, technological and social issues that must be considered carefully by any future e-government initiative in order to achieve a successful acceptance. Beginning with the Greek Local Government case study, findings of the empirical research in sixteen LGOs, demonstrate how an e-government system can be approached and adopted in developing countries, once the identification of advanced
practices and conditions for moving towards successful e-government implementations.

Our experience acquired from the LGAF project also accumulate the research findings derived from Intelcities project (Intelcities project, 2004) that brings together twenty European cities and seventy organizations and research groups aiming at pooling advanced knowledge and experience of e-government planning systems and employees and citizen participation from across Europe. The main constructs included in the proposed conceptual model that attempt to analyze the factors that influence Greek LGOs employees’ adoption have significant similarities with the factors that affect employees’ adoption in local transformational government initiatives in other European countries (Intelcities project, 2004). Specifically, research that took place in local public authorities in European cities, within the scope of the Intelcities project, revealed that almost all the European developing countries are faced with similar issues in the diffusion process of new e-government initiatives as far as the employees’ adoption of the new e-government platforms is concerned. Thus, the research undertaken in both projects convince us that core conceptual models such as this presented in the manuscript can explain the dynamics of employees, who most of times behave on a similar way. Thus, both research projects and previous research (Irani & Love, 2001) revealed that LGOs ‘e-government failure’ is primarily attributable to not meeting organizational expectations that underlines the significance of the human and organisational issues involved in the adoption and diffusion process.

Concluding, the key social, human, organizational and technical issues that affect systems usage and diffusion were investigated. Following an extensive literature review in the field areas of information systems, e-commerce and e-government, a theoretical framework was formulated. The framework was then applied in the case studies to support further data collection and to establish a view of e-government adoption at both LGOs and employees levels. Based on the data collected the initial framework was then revised by using the structured-case approach. As a result, a new conceptual framework which consists of additional concepts and details about the key adoption factors was developed. The framework can be used as a tool to determine the roadmap for adoption of an e-government initiative.
REFERENCES


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City E-Government: Scope and its Realization

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ABSTRACT

In this paper, the authors identify and explore the optimal scope of a generic city-level e-Government program. In order to corroborate theoretical research, a comprehensive feature comparison of different e-Government elements/services, of select city web sites from various countries in the world is conducted. The research finds that despite the manifest common features, the inherent scope of service provision by the websites studied is unique. This finding gives rise to the understanding that customizing e-Government initiatives is ideally conducive to the local needs of the constituents.

Keywords: City Government, E-Government, E-Government Services, Electronic Governance, Scope

INTRODUCTION

The allure of “transformation”, of making the city government agile, efficient, responsive, and of “potential” cost savings, may seem “irresistible” to a new city government that is committed to change the traditional bureaucratic ways of working as well as to reduce taxation. This trend for electronic government (e-Government) is growing, and 189 countries were online in 2008, as compared to 179 countries in 2005 (United Nations, 2008). E-government is being increasingly viewed as a vastly available, increasingly acceptable and generally integral aspect of modern government, with potential to enhance efficiency and effectiveness, reduce costs and even transform the government “affecting the management of human, technological, and organizational resources and processes” (Grant & Chau, 2005, p. 1). As far back as in 2001, in an e-Government conference, “New York City’s then-mayor, Rudolph Giuliani, presented his city’s goals to reduce costs, eliminate bureaucracy and become more open, responsive and accountable” (Ballmer, 2002). Also, it seems that the trend has now shifted from focusing on the “technical issue” of providing a Web site, to having an integrated e-Government solution. The leading consultants’ international firm Accenture, in its sixth annual global report of 2005, “Leadership in Customer Service: New Expectations, New Experiences,” states that “A look at e-Government programs across the globe shows that continued incremental improvements in this area are unlikely to yield significant boosts to maturity. To advance now, governments must
focus on a much broader vision” (Accenture, 2005, p. 1). Such a possibly predicted shift indicates the future provision of customer service to citizens through multiple channels. It is also suggested “that genuine cost savings and quality improvements will occur only if there is a re-engineering of the internal structures and processes of the administration towards a connected form of governance” (United Nations, 2008). These trends are increasingly indicative of the fact that this is the ideal time to rework the basics to bring about the expected efficiency near-future demands will necessitate. We find this as an adequate motivation to study one of the very basic aspects of a city e-government: the scope of a city e-government.

In this paper we attempt to broadly outline the scope of city e-government, essentially to find the area within which the city e-Government is expected to operate. In the absence of any landmark study on the subject it is interesting to look at the scope ab initio. After considering the basic paradigms, we look at some studies which have researched the features of city e-Government Web sites and have set up benchmarks grounded in prevailing theory for the same. Then, we study at the city e-Government Web sites of select major cities across the globe and try to ascertain the area within which these e-governments are practically operating at the present. This gives the study checkpoints for the scope that has been actually realized, or achieved in practice, by these city e-governments.

SYNTHESIS OF LITERATURE

E-Government has been defined in various ways, one of the common definitions being: the use of the Internet to deliver services and information to citizens and businesses (Ho & Ni, 2004; Holden, Norris & Fletcher, 2003; Reddick, 2004a). Arguably, this definition needs to encompass other users, other government levels, and also the government employees. A number of studies have looked into the functioning of e-Government at local levels in the U.S. (West, 2001; Kaylor et al., 2001; Edmiston, 2002; Holden, Norris & Fletcher, 2003; Reddick, 2004a; Ho, 2002; Reddick, 2004b; Moon, 2002), in Canada (Charinh & Robert, 2004; Kernaghan, 2005; Reddick, 2007), in European Union and in other countries (Torres et al., 2005; Criado & Ramilo, 2003; Archer, 2005). While many studies have focused on the evaluation of features of the city e-Government Web sites, their navigability and content standards; benchmarking studies based on optimal set of functions are relatively less (Stowers, 1999; Johnson & Misic, 1999; West, 2000; Spearman, Welch & Associates, 2000; Norris, Fletcher & Holden, 2001; Kaylor et al., 2001). However, features and functions on a Web site are the manifestations of the extent of the scope of e-Government that has been realized, or achieved, in practice. The realized extent of the scope may actually be only a fraction of the full scope of city e-government. In the public sector, scope is of critical importance, as its lays down a boundary, beyond which any use of public monies or government budget may neither be advisable, nor legally possible. We have not been able to find any literature dealing with the scope of local e-Government in this context; therefore, we start my study from basics.

Defining Scope

For the purpose of this paper we define scope of e-Government as the extent, range or area in which it can act or operate; or has power to control in order to attain its objectives. In this paper we would like to view the “scope” in its twin aspects. Firstly, in its “limiting” aspect, beyond which the city e-Government is constrained to operate, “scope” serves a useful function of clearly defining the main area of operation, or even the “raison d’etre” of the e-government. In its second, the “enabling” aspect, “scope” identifies the boundaries, beyond which the city e-Government may “span” to add value, thereby providing its users and/ or citizens with an empowering, integrated and seamless e-Government experience.
Implications of Scope

Ab-initio demarcation of the scope of the city e-Government initiative is critical in two ways. Keeping the scope too narrow initially, would lead to a potential waste of an exciting opportunity. On the other hand, focusing on a scope which is too wide to handle, may lead to increased expectations, which may be hard to meet with limited resources. Because of the opening of an additional channel of communication, and possibly because of its 24/7 availability, and its ease of use; a city e-Government initiative may lead to a change in the pattern and/or volume of citizen initiated contacts (CICs) and requests for action (Horrigan, 2004, cited in Reddick, 2007). Whether an increase in CICs, or a lack of increase, is significant is still a subject of debate. Increased CICs maybe the result of enhanced participation of citizens (Thomas & Streib, 2003). This increased participation may be viewed as benefiting democracy, with increase in service delivery and citizens’ confidence in government (Green, 1982); or even as an indicator of functioning of e-Government (Reddick, 2007). Once a new channel becomes available for providing services, increased CICs may arise from awareness about availability of these services and perceived needs for them (Vedlitz, Dyer & Durand, 1980; Hirlinger, 1992; Thomas & Melkers, 1999). These perceived needs maybe for a specific service or its modification (Thomas & Melkers, 2000; Thomas & Streib, 2003). On the other hand, some researchers argue that CICs may actually decrease because of the clogging of bureaucratic machinery with increased workload (Serra, 1995); while still others argue that CICs will increase because of unhappiness of citizens on any delay in response to requests for action (Moon, Serra, & West, 1993; Thomas & Welkers, 2000).

Since the responsiveness of the city bureaucracy is important for the provision of services, for democracy and for political participation, it is critical to understand the interplay between the scope of e-Government and CIC, and the satisfaction and/or the frustration that unmet needs and expectations can generate. Trying to outline and handle a wider scope than what the city is geared to handle within its limited resources, may lead to an undesirable and maybe unexpected increase in dissatisfaction among the users resulting in negative consequences. Thus understanding scope clearly, in advance, may help in accurate forecasting of the change in workload of city employees that may arise from enhanced service expectations of the citizens because of introduction of the new channel of e-Government. Such a forecast then can be used to suitably mobilize and/or enhance the city resources to cater to increased and/or changing demand for information and service.

Ascertaining the Scope

Issues of Jurisdiction

In a democratic setup, the citizens come together to form a government and generally define its role through a constitution, legislations, acts and subsidiary rules and regulations, which define the area, or scope, within which the government operates. Any action outside this defined area, or scope, is held as ultra-vires. In a top down or a totalitarian type of government, the legal jurisdictions and functions are assigned from the top down and thereby these jurisdictions form a boundary for city government, within which it operates. In between these two extremes there exist a number of models of city government jurisdiction.

Scope of e-Government is legally delimited by the legal jurisdiction of the government. Ideally the e-Government solution should integrate the functions of all the levels of government, i.e. the city, state and federal. In this paper we call such a seamless solution an “integrated e-Government solution”. The overlap of jurisdictions and the position of the integrated e-Government solution across the jurisdictions, and even outside the jurisdictions, is depicted in Figure 1.

Here it is seen that area covered by an ideal integrated e-Government solution can be quite large; it covers individual jurisdictions of the city, state and federal governments; also, it covers the areas of their overlapping jurisdictions;
though not completely. Thus, there maybe specific areas, which are not amenable to an optimal e-Government solution, and these specific areas may be more amenable to the traditional ways of governance, and therefore may lie outside the scope of an integrated e-Government solution. Some areas covered by the integrated e-Government solution ellipse can be seen spanning the strict boundaries of legal jurisdiction. These areas may be interpreted as covering the additional services provided by the e-governments in a commercial domain, and/or covering the seamless services provided by the e-Government to the users in collaboration with private players, for example a page with city tourist information may provide seamless links to the reservation portal serving the hotels in the city.

**Realization of Scope: Practical Limitations**

However, when we try to operationalize this schematic, the scope of an e-Government solution project is further constrained by the shifting boundaries formed by practical limitations. Some of the practical limitations maybe imposed by vision, strategy, technology and budget at the time of implementation. After first implementation, the legacy systems may, in turn, also have a role to play in imposing practical limitations. When we consider of the theoretically possible extent of integrated e-Government solution as depicted in Figure 1, we find that external environment and other factors impose practical limitations on it, as shown in Figure 2, which in effect make the actual city e-Government project much smaller than the optimal solution.

External environment may have a substantial effect, limiting the scope of integrated city e-Government solutions, as changing political and economic scenarios may force the setting of priorities other than launching of e-Government initiatives. For example, a general meltdown of the dot-com industry may have caused hesitancy among many municipal governments while allocating substantial money to e-Government projects in the ensuing years (Roy,
2003). The scope is, evidently, limited by the vision of the city government, as one can generally achieve only what one can envision. Creation of an effective and efficient strategy and its implementation is the next limitation; which in turn has to be supported by the available technology. Budget is the next limitation in realization of the full city e-Government scope because not all technology that is available on a given date maybe affordable or cost effective. This is evidenced by a recent survey, which reported that 55% of surveyed municipal (city) governments in Ontario, Canada, planned a budget of CAD $10,000 or less in a fiscal year for e-government; and only 21% budgeted more than CAD $100,000 (Reddick, 2007). One cannot hope to achieve much in less than $1000 per month, even in terms of stand-alone systems, let alone the supporting manpower. Even the budget, once allocated, has to be expended wisely.

**Value Creation Process**

Once the city e-Government project is budgeted and the implementation phase is rolled out, the scope is affected by the intermediate processes. In any technology project the results may turn out to be different from what is planned initially (Ciborra, 1997). While results in some areas maybe sub-optimal, in the other areas they may surprise even the most optimist proponents of the project. Despite its unpredictable elements, the attainment of the full scope of city e-Government project resulting in a positive e-Government performance, is a goal worth striving for. Thus value creation, in an information technology (IT) project, like e-government, is not a simple process (Ackoff, 1967; Delone, & McLean, 1992; Barua, Kriebel, & Mukhopadhyay, 1995; Hitt & Brynjolfsson, 1996; Delone & McLean, 2003; Melville, Kraemer, & Gurbaxani, 2004). Adapting the model described by Soh & Markus (1995). The multi-step process of value creation in a city e-Government Project is depicted in Figure 3, showing the relationship between the expenditure on e-Government project (see Figure 1) and creation of value as e-Government performance.

From a city e-Government investment perspective, the value creation process starts from city e-Government investment in IT; which
in turn goes through the IT conversion process; which though proper IT management and conversion activities results in city e-Government project assets. Contrary to the seemingly popular belief, the assets themselves do not translate into city e-Government performance (Soh & Markus, 1995). The next step is “IT use process”, where the process can succeed or fail, by appropriate or inappropriate use of the e-Government assets. An “appropriate-use process” is likely to lead to positive city e-Government project “impacts”. In the next step these “impacts” may lead to city e-Government “performance” through good governance processes that are supported by good governance policies and actual political dynamics, which involves the participation of citizens and other users of city e-government. As is evident, the value creation in city e-Government is a complex process, and depends on many critical intervening processes. Failure to understand the complex process may lead to unrealistic expectations and/or inadequate focus on critical intervening processes. This can result in the potential scope of the initiative not being realized and failure to achieve the desired city e-Government performance end results.

**Leadership**

Despite the challenges in realization of scope, outstanding leadership may have a substantial influence on any city e-Government initiative (Ho & Ni, 2003) and thereby on its scope. This effect maybe more critical at the time of initial phase and at the implementation of a city e-Government initiative. The influence may start from the stage of creating a long-term and all-encompassing vision; devising and putting into action an effective and efficient strategy and setting up a dynamic independent team or department to implement the same, which is
important (Reddick, 2007); effectively harnessing the available technology; being successful in getting adequate budget allocated, again a critical “sine qua non” (Reddick, 2007); and ensuring appropriate expenditure on the project. In value creation process (Soh & Markus, 1995) strong leadership may positively catalyze information technology (IT) conversion process, lead the “appropriate use process”, ensure implementation of good governance policies and play a crucial role in political dynamic process leading to superior city e-Government performance. Thus a strong leadership may play a critical role in successful realization of scope of city e-Government initiative (Ho & Ni, 2003).

**Fuzzy Boundaries Of Scope: Integrated City E-Government and the Governance Junction**

When envisaging an integrated e-Government initiative across different levels of government; i.e. the city, state and federal levels; the scope of the city e-Government solution can have fuzzy boundaries. This can translate into a complex integrated structure, forming a “governance junction” at the web-portal, which to an user may look like a simple web-page (Mann et al., 2008). This “governance junction” is a complex integration of functions that needs efficient and effective coordination between different levels of governments, appropriate management of website and functional support at various levels of governance. In addition to the existing governance structures, a suitably empowered coordination cell comprising of members from all concerned government levels, departments and IT experts is a highly useful unit in managing the day to day operations of such a “governance junction”. Here, clearly demarcating the roles and responsibilities between the domain experts (belonging to different government levels) and the IT professionals can smoothen the implementation and operation of the “governance junction” functionalities. This can become an effective tool to handle the fuzzy boundaries of scope of the city e-Government.

**METHODOLOGY**

**A Search for Functional Areas in City e-Government**

To scope out a new project or an expansion project on city e-government, it would be beneficial to look at the functional areas being covered by comparative city e-governments at other places. This would enable us to understand what scope has been actually realized in practice, by the respective city e-Government initiatives.

In their proposed taxonomy of services/functions offerings by e-governments, Charalabidis et al. (2006) do not incorporate the level, maturity or sophistication of services provided. They, however, provide a basic classification or taxonomy, which can be a good basis when a city wishes to start the e-Government initiative *ab-initio*. The authors discuss the European Union’s eEurope+ initiative, which lays down a short-list of “20 Basic Public Services” (Charalabidis et al., 2006, p. 197). The list specifies the service, service-orientation, providing administration, cluster and target level. In listing the ‘Basic Public Services’, the ‘Target Sophistication Level’ is based on the work of Layne and Lee (2001), which has been adopted by the European Commission (2002). Briefly, Layne and Lee (2001) describe the stages of sophistication as follows:

- **Level 1**: Information only / static content: This includes contact information.
- **Level 2**: One-way Interaction / dynamic content: Frequent updates, links to other pages, downloadable documents.
- **Level 3**: Two-way Interaction: Submission of request form, a maximum target level for a service where personal presence is required.
- **Level 4**: Full Case Handling.

Torres et al. (2005) analyze the municipal e-Government Web sites measuring two different variables: service maturity (SM) and delivery maturity (DM). Service maturity is handled in
two dimensions: SM breadth, i.e. number of services offered; and SM depth, i.e. level of interactivity (whether it is possible to “publish”, “interact” and/or “transact”). On the other hand, DM deals with the aspects covering ‘sophistication’ of Web sites to provide benefits to users, viz. error identification feature, search engine, Web site map, use-promotion, availability of email addresses, public events, online access to plenary sessions, online application filling simplicity, multi-lingual access, user-friendly street map, level of comprehensiveness, seamless navigation, e-democracy features etc.

Kaylor et al. (2001) create a rubric for benchmarking the city e-governments in the United States of America (US) using 51 different functional dimensions, under 12 classes. The authors do not evaluate the aesthetics or ease of use, organization or navigability of the e-Government Web sites. However, if the authors do not find a feature in their search, they do not give points for it. By this method itself, the “ease of use”, “organization” and “navigability” may have impacted the study. The authors assign an “e-score” to the Web sites on the basis of following rubric used by Kaylor et al. (2001, p. 306):

1: Information about a given topic exists at the Web site
2: Link to relevant contact with a phone number or email address exists at the Web site
3: Downloadable forms available online on a given topic
4: Transactions or other interaction can take place completely online.”

West (2001) studies the features available on city e-Government Web sites in the US to find how urban e-Government can be improved. After studying 1056 Web sites in the largest 70 metropolitan areas of the US, the author lists top ten online services as: payment of parking tickets or traffic violations, filing of complaints, service request, permit application, job applications, request for documents, payment of utility bills, requests for police documents, payment of taxes and reporting of crimes; in the above mentioned order. The author also finds differences, (on the basis of which 25 short-listed features are offered), between the Web sites of city’s executive branch, the legislative branch and its portal site.

The realized scope of the city e-Government can be assessed from the functions, features and services available on its Web site. For example, Reddick (2007) found in his survey that the state of Ontario lags behind in its city e-Government initiatives. As reported, only about 12% of the surveyed municipal governments provided online tax payments as an option; 20% offered option for online registration of recreational facilities; and 68% offered electronic form downloads for manual completion and submission; also implying that the services available on e-Government Web sites are not uniform even within one state. In practice, the features available on a city’s e-Government Web site may vary substantially. This is especially so when the Web site is designed, based on the differences in, and the varying perceptions of, the local needs. Therefore, to arrive at a framework to study the “realized scope”, we mapped the taxonomy given by Charalabidis et al. (2006); and the features listed in the papers of Torres et al. (2005); Kaylor et al. (2001); and West (2001); arriving at a short-list of 172 features. The services offered, features or the functional areas being addressed by city e-governments, were mapped from the above studies.

Five cities were selected for study and for the comparison of the different services / features available on their e-Government web sites. The city of Ottawa was included because it was the main motivation for this study. It was considered optimal to select one more city from Canada for comparison within the country. Toronto was selected because it is the most populous city in the country, and because Ottawa is also on a growth path, the comparison might be useful for the future. New York was selected from the US, it being the city with the highest population and with a cosmopolitan makeup, which might be interesting to study from an e-Government perspective. Singapore was selected to represent one of the leading
city-states, where all the levels of governments co-exist, and therefore it can potentially be a model of an integrated e-government. Finally, Auckland, New Zealand, was selected to represent a modern developed city from across the globe. Auckland region has a population similar to that of Ottawa, though the city itself had 436,600 residents in 2007 (Auckland City, 2010). The population estimates and Web site addresses of the selected cities are given in Table 1.

We searched for the short listed 172 features and, if offered, assessed the service maturity level by using a rubric based on the one used by Kaylor et al. (2001, p. 306), to calculate an “e-score”. Absent features were assigned a score of zero. (The detailed score allocation table is available in the complete paper). However, there were a number of features available in the city e-Government Web-sites, that did not figure in the mapped shortlist, and thus were not taken into account in this study. This fact does not undermine the importance of these features, or their local relevance. This bypassing of “additional” features is a bias intrinsic to this framework. However, since a large set of important features have been covered, the “e-scores” can be seen as a dependable measure to find, even if in relative terms, to what extent the scope of the city e-Governments have been realized, at least in providing these services/features. In essence, these services/features, as they exist on a city e-Government Web-site, can still be viewed at an “e-Government project asset” stage (Figure 3). How, and to what extent, these available services/features are used; and how, (through an “appropriate use process”), they lead to “e-Government impacts”; and how these impacts, (through a “good governance process”) lead to “e-Government performance” (Soh & Markus, 1995); are questions for further research.

FINDINGS AND DISCUSSION

From the comparison of the features it is seen that all the cities have most of the requisite features on their Web sites. The total e-scores of the five cities were as computed, were: New York 305, Toronto 273, Singapore 300, Auckland 258, Ottawa 269. (The comparative table is given at Annexure A of the complete paper). Thus, it is seen that all the five cities have scores that range from 258 to 305, with a mean of 281 and a standard deviation of 20.46. In view of the fact that the Web sites contain a number of features and which are in addition to the target list, this difference in e-scores in these five cities does not seem to be significant. Also, there is substantial variance in the focus of the features and functions, which is probably linked to variations in the local needs. For example, in Singapore, local e-payment system terminals, known as AXS Stations (pronounce as “Access Stations”) are widely available on the island 24/7, and can be used for a large number of e-Government payments. As these systems can be used for payment of traffic fines or court fines, only Level 3 functionality is provided on the e-Government Web site for some services.

In view of the local variations, the e-scores may generally be deemed at a similar level. Though it would be hard to infer from this small study that the e-Government e-scores in all the five cities were generally equivalent because they have hit a service “plateau”; but the results seem to tally with the findings in the Accenture’s sixth annual global report on government service delivery, “Leadership in Customer Service: New Expectations, New Experiences,” which finds that “all countries experienced a drop from previous years’ overall e-Government maturity scores, which measured the level to which a government has developed an online presence” (Accenture, 2005, p. 1). This has probably happened because continued incremental improvements in this area do not produce commensurate results. So incremental addition of features may average out the target maturity levels. A United Nations 2008 e-Government Survey, From e-Government to Connected Governance, finds that “governments around the world are realizing that continued expansion in e-services is not possible without some kind of integration of back-end government systems...
The new approach maintains that genuine cost savings and quality improvements will occur only if there is a re-engineering of the internal structures and processes of the administration towards a connected form of governance” (United Nations, 2008, p. xv). All this indicates the need for a fresh look at the e-Government, starting from the basics, and providing a solution that grows from infrastructure, to integration to transformation. This transformation; “in management of human, technological, and organizational resources and processes”; is the monumental change, which is the objective of e-Government (Grant & Chau, 2005), and not mere technological change. The study of the scope realized in practice by these five cities indicates a high level of advancement, and all the five cities seem to have crossed over from the infrastructure phase into an integrative phase. Even though the Web sites may seem to be similar, they are merely e-Government assets. It cannot be directly inferred whether they will lead to equivalent e-Government impacts and a superior e-Government performance. It would depend on the (process of) proper use of these assets; and a subsequent good governance process, to produce superior e-Government performance (Soh & Markus, 1995), which would be the ultimate realization of scope in practice. Even though the five cities studied have most of the target features/functions, the scope of services provided by the e-Government Web site of each of these cities is unique and it underlines the need for customizing the e-Government initiatives to the local needs of the constituents.

**CONCLUSION**

This paper outlines the scope of a city e-Government initiative. This research contributes by bringing to light limitations posed by city e-Governmental jurisdiction and external factors. Realization of the scope of city e-Government is discussed from the perspective of process theory. The issue of fuzziness of boundaries of scope in an integrated city e-Government initiative is discussed. The authors introduce the construct of “governance junction” to handle the fuzzy boundary issue. Further, to assess the realization of scope; salient services, functions and features are mapped from different studies. A unique study is conducted for services/features offered by five city e-Government initiatives across the globe to compare and contrast the degree to which they realize the scope, by assigning “e-scores” to their Web sites. It is seen that almost all the five cities are at a relatively high level of maturity in service offerings/features. However this may not necessarily correspond to the city “e-Government impacts” and the results leading to superior city “e-Government performance”. That would require optimal use and good governance processes to be in place and successful. This paper has contributed to literature by outlining the concept of scope of city e-governments, external factors limiting

**Table 1. Cities and their populations (Source: Adapted from New York City, 2010; Brinkhoff, 2010; Statistics New Zealand, 2010)**

<table>
<thead>
<tr>
<th>Sr.</th>
<th>City</th>
<th>Country</th>
<th>Estimated Population</th>
<th>Date of Estimate</th>
<th>City Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Toronto</td>
<td>Canada</td>
<td>5,509,874</td>
<td>01/07/2007</td>
<td><a href="http://www.toronto.ca">www.toronto.ca</a></td>
</tr>
<tr>
<td>4.</td>
<td>Auckland</td>
<td>New Zealand</td>
<td>1,436,400</td>
<td>30/06/2009</td>
<td><a href="http://www.aucklandcity.govt.nz">www.aucklandcity.govt.nz</a></td>
</tr>
<tr>
<td>5.</td>
<td>Ottawa</td>
<td>Canada</td>
<td>1,168,788</td>
<td>01/07/2007</td>
<td><a href="http://www.ottawa.ca">www.ottawa.ca</a></td>
</tr>
</tbody>
</table>
the realization of scope, the progression from scope to city e-Government investments, city e-Government assets, city e-Government impacts, and then to city e-Government performance. This paper has mapped the important city e-Government features in web sites and provided a study comparing five city e-Government initiatives. It finds that, though the elements provided on the Web sites have a number of common features, the scope of services provided by Web site of each of the five cities studied is unique, and it emphasizes the need for customizing the initiatives to the local needs of the constituents.

LIMITATIONS AND FUTURE RESEARCH

The study is limited by the fact that it has explored what already exists, and has considered a limited number of representative studies and five important city e-Government Web sites. Study of five city Web sites is limited by the features / functions considered, which in turn are limited by their dependence on a previous model. An actual survey of users/citizens of the target city and its officials would be invaluable to identify their perceived needs and expectations from the city e-government; such a survey may even throw up new features or areas, which have not been hitherto considered for implementation or research.

REFERENCES


Organizational Development in Electronic Government Adoption: A Process Development Perspective

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ABSTRACT

The concept of Electronic Government (EG) has evolved significantly during the past few decades. Several development models have been presented in the literature to illustrate the advancement and adoption of EG practices. Recent developments in EG adoption that emphasize the process view call for a new perspective to EG adoption. Based on the review of most cited stage models of EG adoption, a comprehensive stage model is recommended in this paper. Furthermore, this paper utilizes the recommended stage model and proposes a process based framework for analyzing the EG adoption.

Keywords: Adoption View, E-government, E-government Adoption, Organizational Development, Process View

1. BACKGROUND

When the military first invented the Internet in the 1960s as a communication network for defense research purposes, it did not envision how the Internet would transform society in just few decades (Ho, 2002). Since the introduction of the Internet, there has been a rapid growth in its use as a communication tool. The exponential growth in internet usage and the application of e-commerce in the private sector, have been mounting pressure on governments to serve its citizens electronically. These applications are recognized in the form of Electronic Government (EG) (Ho, 2002; Holden, Norris & Fletcher, 2003).

The private sector developed the concept of e-commerce, which enables customers to access products and services through a “one stop shop”. While customer convenience is a contributory factor for the private sector to utilize Information and Communication Technologies (ICT), the saving cost helps to motivate companies to invest in e-commerce. The Internet not only changed the way people interact and how information is delivered, but it
also pressured governments to revisit its service delivery models and methods to their citizens (Cohen & Eimicke, 2002). The private sector share the same stakeholder as the public sector, and it is the stakeholders that contribute the most in terms of increasing the level of pressure for governments to hasten the adaptation of ICT as well as diffusion of technology in provision of public services (Donaldson, 1995; Geroski, 2000). In this context, ICT diffusion refers to the gradual adoption of the technology by different groups of stakeholders.

The Internet is becoming more important not just in economic development, but also in organizational development. The Internet, like other communication technologies, has wide political impact on organizations, their stakeholders, and the relationship among them (Milner, 2006). Several scholars have called for the need to examine and understand the process of adoption of innovative technologies in governments. The importance of understanding the adoption process, becomes more vital when the context is an exceptionally complex environment, like the government. The velocity of adopting technology is reliant on the political setting in the government, and the inclination of those in power (Milner, 2006). Some institutions would allow governments and ruling elites embrace the adoption of new technologies – if they yearn to do so – while other institutions would enable them to delay or disrupt it entirely. Despite these considerations the governments around the world, especially evident in the developed countries, have already established ambitious goals for the implementation of EG in the public sector (Aichholzer, 2004). The premise for governments to undertake such transformation in the public sector is: governments understand that quality and the cost of public service will ultimately determine the population’s overall quality of life, the strength of business activities, and political legitimacy of the government (Aichholzer, 2004). Though this article recognizes the implementation of technology involves complex planning and challenging factors, such as fundamentals in public policy, regulations and financial constraints (Jaeger & Thomson, 2003); the position of this article does not advocate for specific implementation measures, but rather, it will provide an analytical overview of the EG adoption process.

The next section of this paper introduces the concept of EG development, and describes the importance of EG development from the public management perspective. Section three, provides evidences for the shift to the process view of EG adoption. In the following section, a comprehensive stage model of EG adoption is recommended. Furthermore, the recommended model is applied in the process view of EG development framework. In section five, the process view of the EG is described explicitly. Finally, the synthesis of the paper is presented in the last section.

2. DEVELOPMENTS IN ELECTRONIC GOVERNMENT: PUBLIC MANAGEMENT VIEW

EG has developed significantly in the recent decades; governments started to observe the role of EG in improving the service delivery to citizens (United Nations, 2005). EG has also evolved in parallel with technological advancements. The procedures of entrenching EG in the public sector are lessons taken from the private sector. One of the goals of EG is to ensure that government services are to be more citizen-centric and service oriented (Seifert & Chung, 2009). Every concept in usage, either in the public sector or in private sector, requires a change from its predecessors. However the changes do not exclude the existence of its predecessor, but instead the changes are inclusive of the predecessor’s foundation and thus, we argue these changes are incremental, and occur within the process development frameworks.

Currently, it is generally established among academies that government departments are beginning to become more collaborative between departments that broke away from its traditional methods of service delivery, where departments have acted independently when directing service
delivery (McGuire, 2006). These developments have paved the way toward the implementation of New Public Management (NPM) designs. Within the NPM, departments gradually begin to implement a system of service delivery that are in reaction to the feedbacks provided by citizens, often described as ‘citizen centered’ service delivery models. NPM is an unintended consequence of the Internet revolution that causes a shift in approach to citizens (Marche & McNiven, 2003). We will argue that this new design is in line, and can be described with the process view of EG adoption.

2.1 Importance of Electronic Government: Developments in the Public Sector

To provide a clear analysis and explanation of the causes for the change in government service delivery mechanisms, which enabled it to incorporate new technologies, this article develops an argument that this incorporation is contributed by paradigm shifts in public administration. Since the late 1990’s, government functions and service delivery methods have changed rapidly; Devadoss, Pan and Huang (2002) reasoned the causes for such transformation is due to the impact of technological advances that enable governments to deliver services via the Internet. Arguably, the advancements of technology also attributed to the adoption of NPM in the public sector. NPM is founded on the themes of desegregation, competition, performance, and a reward system, which promises the move away from traditional practices of public administration toward a transparent and results-oriented form of government (Dunleavy et al., 2005). The implementation of delivery services are directed and supported by efficient and effective public managers (Noordhoek & Saner, 2005). NPM entails the public choice belief that government is too unresponsive, inefficient and a monopoly (O’Flynn, 2007). This is a result of criticisms from the 1970’s of the traditional approach, among many, for being functional insularity, inability to measure performances, react to changing circumstances, along with its inability to enable managers to make independent decisions, which further contributes to its inefficiency (Navarra & Cornford, 2005; Marche & McNiven, 2003). However, according to Hernes (2005) NPM is defined as a set of ideas and methods, of which the goal is to combine accountability and efficiency in public administration but also underscore the inherent tensions between logistics of service and accountability from an organizational structure perspective (Hernes, 2005).

While NPM frameworks are being implemented across western nations, it has rarely been the subject of critique and consequent evaluations. One reason may be that public servants may be viewed as agents who do not support the good order and delivery of the services. Members of Parliament, acting as observers on behalf of citizens, do not show interest in this domain since they may be seen not in control in the eye of citizens (Noordhoek & Saner, 2005). Even though not everyone fully conceptualizes NPM principles, it is generally understood that they are the driving force behind the changes in government administration; however, instead of embracing the principles brought forward by NPM, some people greeted them with cynicism and disbelief (Noordhoek & Saner, 2005). Noordhoek and Saner (2005) argue this case through two examples in Switzerland and the Netherlands; both have the knowledge and capital to fully embrace NPM, but instead the principles of NPM evoked a reaction jaded by distaste for a too rational and non-political approach towards people and organizations. In 2004, the region of Zurich voted to halt all NPM related administrative reforms; in the Netherlands, the cabinet and Parliament favored a report that called for the end of the independent status of arms length agencies, which is a pivotal element of NPM (Noordhoek & Saner, 2005). Noordhoek and Saner (2005) argue that these are examples of decline in NPM. However, the authors of this article do not agree or disagree the argument presented since countries such as Australia and New Zealand are exemplars of NPM (O’Flynn, 2007), but rather this ar-
article is taking a different road to analyze this paradigm shift.

This new approach highlights the role of governments meeting the demands of citizens, while at the same time positioning themselves to react to changes. As a result, the new term of public administration in the current millennium is one that identifies a horizontal network that composes of private, public and non-profit organizations (Bingham, Nabatchi & O’Leary, 2005). In other words, governance undertakes a stakeholder perspective. According to Freeman (1984), a stakeholder is categorized into four groups: shareholders, employees, customers, and members of the general public (as cited in Clarkson, 1995). The new approach of governance would regard voters as the stakeholders, public administrators as employees, users of governance as customers, and non-voters as members of the general public. EG can be utilized in promoting greater public participation in governance, while concurrently enabling government to better provide services. As Gil-Garcia and Pardo (2005) argue EG focuses on the conceptualization of information technologies for the purpose of public service delivery, to improve effectiveness in public management, as well as the promotion of democratic values and mechanisms.

In the following sections of the paper, this shift of analysis is described at various aspects of EG development. Specifically we provide evidence of the developments at definition, scope, activity, and organizational development associated with EG. Furthermore, we adopt the process view of organizational development into the context of EG development.

3. ELECTRONIC GOVERNMENT: PROCESS OF INCORPORATING TECHNOLOGY

This article argues toward the evolutionary process development view. This will contribute further to extend our knowledge of the best practices, protocols, and implementation processes of EG in service delivery. To better understand the domain of EG, a review of some of the most cited definitions of EG was conducted. Table 1 displays some of these definitions.

The definitions are sorted by their year of publication. For each definition, the focus of the definition is highlighted. As illustrated in Table 1, there are in fact three trends. The first is technology, as to what technology is and does. The second is the technical aspect of adoption, where it provides description of how technologies are used. The third trend is process adoption, where it gives more focus on analyzing how technologies are incorporated into organizational operations.

There exists a shift in EG literature, from one which focuses on the technology aspect of EG, to the one which is centered around the adoption process of EG. This view is supported in several recent studies including: Dwivedi, Weerakkody and Williams (2009), Azad and Faraj (2009), Janssen, Joha and Zuurmond (2009), Yoon and Chae (2009), Navarra and Cornford (2009) and Kim, Kim and Lee (2009). The focus of this study is mainly on adoption process aspect of EG, however it is recognized that technology and adoption process are complementary of each other. Bearing in mind these developments, we first explore the stage view of EG development. Following that, the process view is adapted to a multidimensional model of EG development.

4. ELECTRONIC GOVERNMENT ADOPTION

Stages of EG development have been a topic of interest during the past two decades. Several models of EG implementation are presented in the literature, which illustrate the developments in this area. The adoption of EG services can be viewed from different perspectives. The stage view and process view of the EG adoption are the two most common and tightly related views of EG adoption. In this first part of this section, the stage view of EG implementation is described. Later the process view is introduced and described as a more recent and
Table 1. Definitions of electronic government

<table>
<thead>
<tr>
<th>Author</th>
<th>Definition</th>
<th>Focus</th>
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<tbody>
<tr>
<td>Heath (2000)</td>
<td>Government becomes e-government when the public sector digitizes its processes and interactions, whether internal or external with business or with the public</td>
<td>Technology</td>
</tr>
<tr>
<td>Allen, Juillet, Paquet and Roy (2001)</td>
<td>IT-led reconfiguration of public sector governance—and how, knowledge, power, and purpose are redistributed in light of new technological realities.</td>
<td>Technology</td>
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<tr>
<td>West (2001)</td>
<td>The delivery of government information and services online through the Internet or other digital means</td>
<td>Adoption</td>
</tr>
<tr>
<td>Gómez and Ospina (2001); Beaudin (2001)</td>
<td>The use by government agencies of information technologies that have the ability to transform relations with citizens, business, and other arms of the government creating a wealth of new digital connections</td>
<td>Technology</td>
</tr>
<tr>
<td>Gronlund (2001); Turban et al. (2002)***</td>
<td>The strategic application of information and communication technology to provide citizens and organizations with more convenient access to government information and services; and to provide delivery of public services to citizens, business partners and suppliers, and those working in the public sector.</td>
<td>Adoption</td>
</tr>
<tr>
<td>Fang (2002)</td>
<td>A way for governments to use the most innovative information and communication technologies, particularly web-based Internet applications, to provide citizens and businesses with more convenient access to government information and services, to improve the quality of the services and to provide greater opportunities to participate in democratic institutions and processes</td>
<td>Adoption</td>
</tr>
<tr>
<td>Criado, Hughes and Teicher (2002)</td>
<td>Refers to the adoption of information and communication technologies (ICT) by government to improve access to services</td>
<td>Technology</td>
</tr>
<tr>
<td>Muir and Oppenheim (2002)*</td>
<td>e-Government refers to the delivery of [government] information and services online through the Internet or other digital means</td>
<td>Adoption</td>
</tr>
<tr>
<td>United Nations (2002)**</td>
<td>The use of information and communication technologies to provide public information and services to citizens and businesses.</td>
<td>Adoption</td>
</tr>
<tr>
<td>Breu, Hafner, Weber and Novak (2005)</td>
<td>The use of the Internet and other electronic media to improve the collaboration within public agencies and to include citizens and companies in administrative processes</td>
<td>Adoption</td>
</tr>
<tr>
<td>West (2005)</td>
<td>Public sector use of the Internet and other digital devices to deliver services, information, and democracy itself.</td>
<td>Adoption</td>
</tr>
<tr>
<td>Irani and Elliman (2008)</td>
<td>Process of delivering information and services to customers (citizens, business, and public administration) electronically by Government.</td>
<td>Adoption</td>
</tr>
<tr>
<td>Lee, Irani, Osman I, Balci, Ozkan and Medeni (2008)</td>
<td>E-Government is the process of delivering information and services to customers (citizens, business, and public administration) electronically by the government</td>
<td>Adoption (Process View)</td>
</tr>
<tr>
<td>Lau, Abouhouson and Atkin (2008)</td>
<td>The process of connecting citizens digitally to their government in order that they might access information and services offered by government agencies</td>
<td>Adoption (Process View)</td>
</tr>
<tr>
<td>Walser, Kuhn and Reidl (2009)</td>
<td>E-government refers to the support of business processes within and across the public administration through the application of IT</td>
<td>Adoption (Process View)</td>
</tr>
</tbody>
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* As cited in Kumar, Mukerji, Butt, Persaud (2007)
** As cited in Dimitrova and Chen (2006)
*** As cited in Phang, Sutanto, Li and Kankanhalli (2005)
compatible view of EG. The first part of this section identifies eleven, EG adoption stage models based on a comprehensive literature review. The stages in the development models are carefully investigated and subsequently a six-stage EG adoption model, is proposed which presents the comprehensive view of the current EG development models. Figure 1 displays the various models and the proposed six-stage model.

According to the proposed six-stage model, EG starts with a unidirectional display of information known as catalogues. In the second stage, the users of the system can interact with the service provider to complete certain tasks. Third stage is categorized with provision of expanded services and personalized solutions for users (Al-Sebie, Irani, & Eldabi, 2005). In the fourth stage of EG development, the services will allow the users to complete certain transactions. Fourth stage is the integration of services and processes in government for enabling the provision of seamless and more diverse services. This fifth integration stage will require vertical and horizontal interaction within and among various functions (Hiller & Belanger, 2001; Backus, 2001). The last stage is organizational transformation, which focuses on automation of organizational processes and transformation of organizational structure as an enabling factor to provide higher level of services to citizens. To achieve

Figure 1. Stages view of electronic government development

<table>
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<tr>
<th>Author/s</th>
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<tr>
<td>Cataloging</td>
<td>Interaction</td>
</tr>
<tr>
<td>Hiller and Belanger (2001)</td>
<td>✔</td>
</tr>
<tr>
<td>Backus (2001)</td>
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<tr>
<td>Layne and Lee (2001)</td>
<td>✔</td>
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<tr>
<td>Howard (2001)</td>
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<tr>
<td>Atallah (2001)</td>
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<tr>
<td>Baum and Di Maio, cited in, Seifert and Petersen (2002)</td>
<td>✔</td>
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<tr>
<td>Chandler and Emanuels (2002),</td>
<td>✔</td>
</tr>
<tr>
<td>Deloitte research cited in (Al-Sebie, Irani, and Eldabi, 2005)</td>
<td>✔</td>
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<tr>
<td>Reddick (2004)</td>
<td>✔</td>
</tr>
<tr>
<td>Murphy (2005)</td>
<td>✔</td>
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</tbody>
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1 Includes two stages: Vertical Integration; Horizontal integration
2 Includes two stages: emerging; enhanced.
3 Includes three stages: Multi-purpose portals, Portal personalization, clustering of common services.
4 Consider integration and org. transformation as a single stage.
5 Includes two stages: Automating & Transformation of business processes; rethinking policy objectives.
this goal, governments will be required to set new “policy objectives” aligned with the new information technology and novel processes. As it is evident from this study, process view of operations, is an integral part of the EG development. The process view of the context of EG is further described on the following section.

### 4.1 Process View of Electronic Government Adoption

In the previous section, the stage models of EG development were described and a proposed comprehensive model was developed. Process view of the EG, as an integral part of EG development, is identified to be the more recent focus of EG development.

The development of EG can be studied at three levels: technology, internal processes, and external processes (Hiller & Belanger, 2001). Significant changes at the technology level during the past two decades have enabled organizations to move from provision of catalogue information to present dynamic and transactional services to citizen. Moreover, the attention to internal and external processes has allowed governments to align their information infrastructure with citizens’ needs and operational capabilities. The increased maturity of EG operations calls for a shift of attention from management of inter-functional processes to intra-organizational and inter-organizational processes (Gottschalk & Solli-Sæther, 2008). At the early stage of EG adoption, governments are still focused on operation of processes within specific functions. To provide advanced services through EG, organizations start intra-organizational integration to share knowledge. Institutionalization of new processes is a key factor to succeed at this stage. However, to produce further value through EG, the integration of processes, as well as institutionalization of processes needs to be expanded across various organizations involved in EG services. Finally, there is a need to align strategic goals of various government agencies with citizens’ requirements and needs (Gottschalk & Solli-Sæther, 2008).

Based on the review of most cited studies in the area of EG development, a framework is proposed to illustrate the process view of EG. This framework is constructed based on the various levels of EG analysis (Hiller & Belanger, 2001), scopes of analysis, core activities in each domain (Gottschalk & Solli-Sæther, 2008), the proposed stage model of EG development and process development in organizations (Melao & Pidd, 2000). EG, in this model is viewed as a tool toward organizational development, where organizations experience a sequential growth, institutionalize new processes and alter their activities and structure (King & Toe, 1997). Figure 2 illustrates the process view of EG development.

According to the proposed EG development model, the current scope of analysis in EG adoption is focused on inter-organizational processes. As a result, the core activity in EG adoption is strategic alignment among various departments (Gottschalk & Solli-Sæther, 2008). Consequently the EG adoption currently is believed to be at the “activity and structure evolvement” level of organizational development (King & Toe, 1997). This is in line with the latest stage of EG development, which is organizational transformation. In the following section, it is described that the EG development is adaptable to the process view of organizational development. Furthermore, social view is described as the current stage of EG development in public sector.

### 5. THE PROCESS VIEW OF ELECTRONIC GOVERNMENT DEVELOPMENT

Melao and Pidd (2000), in their seminal study of organizations describe a four-stage model of organizational development. Melao and Pidd, (2000) model is the centerpiece of the EG adoption framework. It is applied to develop the proposed EG adoption framework in this study. According to Melao and Pidd (2000), during the organizational development the execution of processes in organizations is viewed from
four perspectives, namely: Mechanistic View, Dynamic View, Interacting feedback loops, and Social Views. In this section, each view is presented and discussed in the context of EG.

**Mechanistic View**

In the context of a mechanistic view, the focus is made toward provision of services based on the functional view of service delivery. This view supports an operational perspective that focuses on efficiency and value of defined processes. For example, this view demonstrates that there is a need for governments to reduce transaction costs, while simultaneously increase or maintain efficient service delivery (Berenice & Baron, 2009). According to Finger and Pécoud (2003) the governments (states) has undergone substantial transformation over the past 15 to 20 years, which are caused by series of factors and pressures that have made the governments, to adapt to a new and increasingly global environment. Government’s delivery of services to the public incurs a great amount of expenses which are associated with extent of specialized investments have to made to carry out transactions (Ellis, 2004). The underlying incentive for governments to deliver as much as their services in electronic form as possible, is to reduce transaction costs. The governments therefore, rely on improving theirs operational structure, as oppose to its regulation or policy-making functions (Finger & Pécoud, 2003). The government also sought to decrease the financial pressure by passing on the reduced transaction costs to citizens, the primary user of government services; while at the same time increase the government’s legitimacy via improving the quality of its services by competitively modernizing its departments (Finger & Pécoud, 2003). However, the barriers that are still prominent in comprehensive implementation of EG include: security, privacy, and financial commitments by governments which are compounded. In addition, administrators and policy makers lack the knowledge and historical expertise in IT management (Norris & Moon, 2008). Moreover, provision of online government services goes beyond enabling user access to information. It also requires inter-operability between departments and agencies that are part of the EG system, and a stable IT infrastructure that can handle trading of data between central processors (Norris & Moon, 2005). Where infrastructures are insufficiently established, it can lead to information system downtime that will negatively affect the ability for the system to provide services to its users (Ellis, 2004).
Dynamic View

Government departments have traditionally operated based on the functional design of organizations in the delivery of services, where each individual department has its own culture and operational procedures. Government services have however, evolved toward provision of citizen-centered services. The outcome of government services are delivered in an asymmetrical manner where various service delivering agencies are not just collaborating with each other, but the services that are being delivered fall within the realm of customer service relations. These services are reflective of the needs and wants of its end customers (Patel, 2007). Governments have increasingly begun to offer electronic services that meet the needs of their citizens’ life and their business transactions. These services promise enhanced accessibility, and reduced delivery delays and costs (Gouscos, Kalikakis, Legal & Papadopoulou, 2007). These goals require a dynamic view of process.

Prior to EG services, citizens and businesses would often face bureaucratic obstacles when trying to use government services, as procedures were vague and in some cases there was overlapping authority between departments (Gouscos, Kalikakis, Legal & Papadopoulou, 2007). However, given the historical experience of government services delivery, there tends to be a lack of confidence in the government having the ability to provide a resolution that will reduce the lack of trust by its services users (Belanger & Carter, 2008). Trust is defined according to Rotter (1971) in Belanger and Carter (2008) as an expectancy for a delivery of a result that promise toward an individual, group or organization can be relied upon in providing, and are rooted in social learning theory (Belanger & Carter, 2008). This study does not focus on whether users of government services will distrust or trust EG services, the Internet and the government’s ability to resolve user’s historical concerns about bureaucratic services. Rather, it is argued that there exists a trend where governments are undertaking, as a process, to deliver services that are in reflection of citizen needs and societal changes.

Interacting Feedback Loops

With the developments made in technological aspect of EG infrastructure and the competency of users, the EG systems started to adopt interacting feedback loops in their operation. The early stage of EG had been primarily focused on the need to deliver pure data, where user friendliness and addressing various usage trends were not a priority. However, the rise and mass integration of the digital age from work to daily communication activities have imposed changes in EG. These changes would require the governments to ensure that users of services are successfully engaged. This called for more attention to the client-adoption aspects of EG services, such as user friendliness and tracking of usage trends. These developments have also paved the way for promotion of higher transparency in government (Bekkers & Moody, 2009).

The emerging trend of using information technology tools by the general populations, along with technological advancements in this area, has not only captured the attention of the businesses, but also government decision-makers, policy institutions and public administrators (Andersen & Henriksen, 2006). Currently, there are wide ranges of research on the best approach on how government delivery services should move forward, where the transformation scope will include external users such as citizens, businesses, and arms-length government agencies (Andersen & Henriksen, 2006). However, the challenge facing public administrators is not only merging IT into government services delivery; another major challenge is the adoption of internal structure that emphasizes citizen-centric and not bureaucratic-centric view (Seifert & Chung, 2009). Prior to undertaking the transformation to EG, administrators and policy-makers must select appropriate services from hierarchical repositories, where the specifically chosen category for each service needs to be a known priori. In doing so, administrator will understand their implicit semantics, which will enable them to design an effective and stable framework where control mechanisms and data flow structures are
appropriately designed (Barnickel, Fluegge & Schmidt, 2006). As what Finger and Pécoud (2003) call “operators’ modernization”, have allowed public services to be delivered increasingly similar way than private and third sector operators. This can provide a potential for the modernized public sector to ultimately be operated partially by private or third sector actors (Finger & Pécoud, 2003).

**Social Views**

The most recent development in EG services is the need of greater attention to social view of services. The social view of the EG processes is concerned with the way the outcome of the EG services can address the customers’ needs and expectations. This social view goes beyond the adoption of technology and enhances the capabilities of users to utilize the EG potentials (Macintosh & Whyte, 2006). Macintosh and Whyte (2006) highlight the importance of social view of EG process, by describing that the success of any EG initiative is pending the participation of citizens. Having a top technical system without the citizens’ participation is an example of failed EG initiative. Maad and Coghlan (2008) describe the shift of focus from technical view of EG service to a social perspective. In a recent study, Grundén (2009), expanded this social view of EG services and described the social consequences of services in EG. From her perspective, EG not only includes the end users of the services (the citizens), but also includes the government employees and system operators. During the EG development process, advances along with technical and structural changes should be accompanied with training of the employees about the new ways of doing things. Grundén (2009) views competency development as an integral part and the most social aspect of EG development. Building on the foundation of organizational developments in EG service provision, this study proposed an EG adoption model which includes the social view of EG services.

**6. SYNTHESIS**

The development of electronic services delivery in governments has evolved substantially within a short period. Departments are becoming more reliant on ICT as the primary channel for citizens and businesses to access their mandated services. Such development of usage is becoming part of the general practices of department strategic planning and will only continue to grow in its importance. The changes that have been made in government service delivery mechanism are not purely in response to shifts in public administration, or shifts in technology advancements and the private sector inclusively; but rather the policy to transform government services are to reflect the emerging citizen expectations, their trends and the need for fiscal conservation. The resulting effects of EG in the new era of public service delivery is the institutionalization of EG into the public domain. The present study contributes to the existing literature by describing the developments in the EG. The current scope of analysis in EG adoption is structured around attention to inter-organizational integration, while the required core activity in this period is identified as strategic alignment among various stakeholders. In regards with the organizational development view of EG, currently governments are concerned with recognizing the required new activity and structure, as well as identifying the best organizational transformation plan. From the process perspective, addressing the social view of EG services is presented as the current major issue, facing public sector. The proposed model is a reflection of the trends that are being implemented in the public sector, and have its share of resentment by public administrator due to the fact that EG is viewed as an external agent that is not part of the traditional framework of public service delivery. However, EG ultimately becomes more utilized and integrated partly due to paradigm shifts in public administration and partly due to the advancement of technology. The proposed EG development model can be employed in future studies for analyzing the current practices and plan of the future EG developments.
REFERENCES


Identifying Factors of Integration for an Interoperable Government Portal: A Study in Indian Context

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ABSTRACT

Interoperability is an important pre-condition for achieving higher stages of e-government and further ensures that a one stop portal will become a reality. Interoperability results from vertical and horizontal integration. The question arises: How can the level of interoperability and degree of integration be ascertained? This paper suggests a framework. It begins by identifying critical factors necessary for the successful adoption of interoperability technology along three dimensions of integration—process integration, communication integration, and data integration. Factors are formed from a literature review and discussions with webmasters and IT professionals working on portal development in various government departments of India. These factors are useful in further evaluation across the three dimensions and locate the position of a government portal in a technology adoption space. It is then possible to ascertain a portal’s current level of integration sophistication.

Keywords: E-Government, Integration, Interoperability, Maturity, One-stop Portal

1. INTRODUCTION

One-stop government portal has emerged worldwide as a trend to offer electronically administrative service packages that meet the needs of citizens’ life events and business transactions, with a promise to enhance service accessibility and alleviate service delivery delays and costs. For citizens, it is an important interface that can bring entire government at their doorstep to the extent that it might almost mirror the government itself. One-stop portal becomes a reality if back offices are interoperable (Choudrie & Weerrakody, 2007). Interoperability among Government organizations has been identified as a central issue and a critical prerequisite for the effective functioning of contemporary organizations systems (Klischewski, 2004; Peristeras et al., 2007; Tambouris et al., 2004; Tambouris & Tarabanis, 2005). To achieve an interoperable government, the integration
of government information resources and processes, and thus the interoperability of independent information systems, are essential. Economic benefits of interoperability result in lower transaction costs typically utilizing standardized processes. Yet, most integration and interoperability efforts face serious challenges and limitations. Exchanges of information and services are fragmented and complex, plagued by technical and organizational problems (Gouscos et al., 2007).

A distinction should be made between interoperability and integration. Integration is the forming of a larger unit of government entities, temporary or permanent, for the purpose of merging processes and/or sharing information. Interoperation in e-Government occurs whenever independent or heterogeneous information systems or their components controlled by different jurisdictions, administrations, or external partners work together (efficiently and effectively) in a predefined and agreed-upon fashion. E-Government interoperability is the technical capability for e-Government interoperation (Scholl & Klischewski, 2007).

In this paper, attempts are made to identify the organizational and technical factors of integration for an interoperable government portal in Indian context. A three-dimensional adoption space model proposed by Chen et al. (2005) has been taken up to measure the level of integration. Three dimensions of integration are: Data, Process and Communication. All the dimensions and organizational factors are inter-related. Additionally, the factors of each dimension are in either positive (reinforcing) or negative (balancing) feedback loop. Key inter-relations are demonstrated through causal loop diagrams as they enhance learning processes in the organisation by evaluating individual’s performance based on strategically linked measures (Banker et al., 2004). By identifying the factors along with their relationships, scholars and practitioners have a framework within which they can measure the current position of an organization and focus on improving the factors to achieve interoperability.

The structure of the paper is as follows. In the following section, relevant literature on interoperability is laid out. Section 3, discusses the research methodology used in this research. Next, Section 4 introduces important organizational factors contributing to Integration maturity and influencing the adoption of Interoperability. Section 5 presents integration in three dimensions – data, process and communication and proceeds with their relevant determinants. Section 6 delves into synthesis of affiliation of organizational factors and the technical factors (three dimensions) including discussion. Finally, in section 7 the article offers some conclusions that include limitations of the paper along with future work.

2. LITERATURE REVIEW

The term Interoperability has been defined by different organizations and authors: The European Commission (2003) has defined interoperability as “the means by which the inter-linking of systems, information and ways of working, whether within or between administrations, nationally or across Europe, or with the enterprise sector, occurs”. Interoperability is the ability of government organizations to share information and integrate information and business processes by use of common standards and work practices (State Services Commission, 2007). According to the Government Interoperability Framework (Office of the E-Envoy, 2004) and Government CIO (2007), if the coherent exchange of information and services between systems is achieved then the systems can be regarded as truly interoperable. When information and services are provided to and accepted between systems and organizations, they are said to inter-operate.

Interoperability of systems enables interoperability of organizations. Systems interoperability is concerned with the ability of two or more systems or components to exchange information and to use the information that has been exchanged. Organizational interoperability is concerned with the ability
of two or more units to provide services to and accept services from other units, and to use the services so exchanged to enable them to operate effectively together (Legner & Lebreton, 2007). Further interoperability facilitates the re-use of the information (resources) once the levels of integration are achieved. As identified by Traunmüller (2005) and Landsbergen & Wolken (2001), the benefits of interoperability become clear in the following settings: more effectiveness (interconnection instead of isolated solutions), efficiency (reduction of the transaction costs and increase of the involved agents’ participation), and responsiveness (better access to more information, making possible the fastest resolution of the problems).

In a narrow sense, the term interoperability is often used to describe technical systems. In a broader sense, social, political, and organizational factors influencing systems and systems performance must also be taken into account (Gottschalk, 2009). Klischewski and Scholl (2006) further stress that systems and applications that interoperate are characterized by the following aspects: independency, heterogeneity, and control by different jurisdictions/administrations or by external actors; yet also cooperation in a predefined and agreed upon fashion. Likewise, Wimmer et al. (2006) stress that interoperation can only be reached by means of open standards, whereby interoperation needs to be addressed on technical, semantic and organizational level alike. The European Interoperability Framework (2003) (EIF) definition identifies three separate aspects: 1. Technical – linking up computer systems by agreeing on standards for presenting, collecting, exchanging, processing, transporting data; 2. Semantic – ensuring that transported data shares the same meaning for link-up systems; 3. Organisational – organising business processes and internal organisation structures for better exchange of data. When dealing with pure technology, the interoperability concept may be defined according to the software discipline, which understands interoperability to be the “ability to exchange functionality and interpretable data between two software entities” (Mowbray & Zahavi, 1995). Issues covered by this concept are usually grouped in two fields: Application interoperability, which includes the communications issues, both at the telecommunications network access level and at the network interconnection level; and the distributed applications issues, regarding the remote procedure call/method invocation mechanisms and the public interface exportation/binding; Semantic interoperability, which includes both the data interpretation, by means of XML schemas, and the knowledge representation and exploitation, by means of ontologies and agents.

Currently there are several research efforts that try to address interoperability issues in e-government in all three EIF dimensions. Guijarro (2007, 2009) surveyed existing e-government interoperability initiatives and enterprise architectures in the EU and USA. Naiman and Okelse (1995) classified semantic conflicts in database systems. Park and Ram (2004) also give a description of semantic interoperability conflicts regardless of the application domain, while Ram and Park (2004) propose the resolution of these conflicts using ontology.

There have been initiatives carried out by e-government organizations in the interoperability arena, which have developed the corresponding interoperability frameworks in different countries of the world (Guijarro, 2006). Table 1 summarizes main features of the e-government initiatives. In the United Kingdom, the e-government Unit (eGU), formerly known as Office of the e-Envoy, has based its technical guidance on the e-government Interoperability Framework (e-GIF), which was issued in 2000 (UK Government, 2000). It covers four areas: interconnectivity, data integration, e-services access, and content management. The French ADAE (Agence pour le Développement de l’Administration Électronique) published in January 2002, comprises the recommendations for strengthening public electronic systems coherence and for enabling multi-agency electronic service delivery. Germany’s Federal Government Co-ordination and Advisory Agency
for IT in the Federal Administration (KBSt), published the Standards and Architectures for e-government Applications (SAGA) in February 2003. SAGA serves as an orientation aid for decision-makers in the e-government teams in German administrations. In Denmark, the National IT and Telecom Agency published the first version of an interoperability framework in 2004 under the name of Danish e-government Interoperability Framework (DIF). DIF is intended as a guideline to public agencies as they develop IT plans and projects. In the United States, the Federal Chief Information Officers Council (CIO) issued the Federal Enterprise Architecture Framework (FEAF) in September 1999. The Asian countries like Hong Kong, Malaysia and Sri Lanka have also developed their interoperability frameworks. Malaysia has Malaysian Government Interoperability Framework (MyGIF) which was issued in 2003; Hong Kong has Hong Kong Special Administrative Region (HKSARG) framework issued in 2005 and Sri Lanka’s framework is LIFE which was issued in 2006. All these frameworks provide Interconnection, data integration, information access, Security and metadata.

In Table 1, majority of the interoperability frameworks are performing data integration. Other focus of the frameworks is: interconnection, content management metadata, telecommunication network access, workflow management, group working, and security.

For interoperability both horizontal and vertical integration forms the basis. Integration can be defined as “the forming of a (temporary or permanent) larger unit of government entities for the purpose of merging processes [and systems] and sharing information” (Klischewski & Scholl, 2006). Integration can be approached in various manners and at various levels (Verna-

<table>
<thead>
<tr>
<th>Country</th>
<th>Interoperability framework</th>
<th>Organization</th>
<th>Year of release</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>e-GIF (E-government Interoperability Framework)</td>
<td>eGU (e-government unit)</td>
<td>2000</td>
<td>interconnectivity, data integration, e-services access and content management metadata</td>
</tr>
<tr>
<td>France</td>
<td>CCI (Le Cadre Commun d’Interopérabilité)</td>
<td>ADAE</td>
<td>2002</td>
<td>enabling multi-agency electronic service delivery</td>
</tr>
<tr>
<td>Germany</td>
<td>SAGA (Standards and Architectures for e-government Applications)</td>
<td>KDSt</td>
<td>2003</td>
<td>orientation aid for decision-makers in the e-government teams</td>
</tr>
<tr>
<td>Denmark</td>
<td>DIF (Danish e-government Interoperability Framework)</td>
<td>ITST</td>
<td>2004</td>
<td>guideline to public agencies as they develop IT plans and projects</td>
</tr>
<tr>
<td>USA</td>
<td>EAG (E-government Enterprise Architecture Guidance)</td>
<td>CIOC</td>
<td>1999</td>
<td>guiding the e-government projects across the federal government</td>
</tr>
<tr>
<td>Malaysia</td>
<td>MyGIF (Malaysian Government Interoperability Framework)</td>
<td>2003</td>
<td>Interconnection, data integration, information access, Security and metadata</td>
<td></td>
</tr>
<tr>
<td>Hong Kong</td>
<td>(HKSARG) Hong Kong Special Administrative Region</td>
<td>IFCG</td>
<td>2005</td>
<td>Data integration, security</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>LIFE</td>
<td>ICTA</td>
<td>2006</td>
<td>Data integration, metadata</td>
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dat, 1996) for example: (i) physical integration (computer networks), ii) application integration (integration of software applications and database systems) and (iii) business integration (co-ordination of functions that manage, control and monitor business processes).

E-Government interoperability has become a crucial issue because recent ICT investments have reinforced the old barriers that made government decision-making, not to mention citizen access to public services, difficult. In a number of governments, agencies are deploying new ICT systems with specifications and solutions relevant to their particular needs but without adequate attention to the need to connect, exchange and re-use data with other agencies’ ICT systems. The result is a patchwork of ICT solutions that is not always compatible with each other and an e-government programme that does not meet its goals.

However, there are significant barriers to achieve interoperability in an effective and wide way. These barriers can be classified as politics, organizational, economical and technical (Andersseen & Dawes, 1991): Political - conflicts in the definitions of the levels of privacy in the accesses to the information, predominant organizational culture, etc.; Organizational - lack of experience and absence of the predisposition of sharing, organizational culture, etc.; Economical - lack of resources for disposing the information for other agencies, form of acquisition of the resources, etc.; Technical - incompatibility of adopted hardware and software; property rights. Therefore, interoperability standards setting can be considered as a hard task to achieve, since the defined specifications have to overcome several barriers to be adopted.

It is often found that Government portals are still far behind the stages of either of their integration steps. The adoption of a new technology such as Interoperability involves a proper assessment of the status of integration (process integration, data integration and technical integration) within the government. Therefore, understanding the factors relevant to the adoption of interoperability will help in achieving integration and further achieving interoperability. Higher the level of integration of an organization, lesser the resources needed to adopt the interoperability technology.

3. RESEARCH METHODOLOGY

Maturity of integration can be understood by the degree of sophistication. “Degree of sophistication” here refers to how an organization applies different technology components, structural factors and human factors for its applications (Gomond & Picavet, 1999; Wollschlaeger, 1998). Further an organization’s information technology maturity depends not only on the technological aspect but also on various organizational characteristics (Benbasat et al., 1980; Cheney & Dickson, 1982). Layne and Lee (2001) highlighted the fact that achieving more mature levels of e-government requires higher levels of both technology and organizational complexity.

Evaluating the maturity level of integration requires assessment of integration from multiple dimensions. In our study, integration has been divided into three dimensions: Data Integration, Process Integration and Communication Integration. Given these dimensions, adoption space model proposed by Chen et al. (2003) has been followed to locate the position of an organization’s portal for interoperability (Figure 1). Thus it is necessary to specify the factors that contribute to each of the three domains identified. In this study, we focus on determining those organizational and technological factors that are considered explicitly or implicitly critical for measuring integration sophistication in Government departments (Chen et al., 2003) in the context of adopting Interoperability. The organizational factors are inputs and the technical factors are outputs.

After identifying the dimensions, the position of an organization can be located (point P) through different mechanisms for measurement (Chen et al., 2003). Once the coordinates of an organization in the adoption space are found and the destination is decided, the distance between point P and desirable destination rep-
entes the effort that the organization needs to make in order to achieve the desired amount of Interoperability adoption.

The factors were identified from two sources. First, review of current literature in information systems research is used to identify factors found to influence the success of IT initiatives. This review includes the scanning of the top journals in public administration. Articles with a focus on e-government success factors were selected. The literature review also includes selected journal articles and book chapters that specifically address IT success factors in both public and private organizations. Second, interviews and discussions with the high rank Government officials in India were conducted. The officials were selected on the basis of their involvement with e-government initiatives within departments in central and state governments in India. Few of them are responsible for the national portal of India. Interviews were conducted both personally and over the phone. An in-depth knowledge about portal development and interoperability was attained. This approach provides an opportunity to integrate users in the system design in a feasible manner. Literature review provides a scenario of past that helps in understanding the issues and challenges of the subject. Interviews with experts give clarity on the current situation and helps in finding the key factors. The interview is again a fine method with which to identify incidents that are critical for (dis)satisfaction with the service (Gremler, 2004).

4. ORGANIZATIONAL FACTORS

Besides the technological factors, organizational factors also play a vital role in achieving complete interoperability. In favour of this, organization has to gear up several resources and support which may be a challenge. Studies from the literature reveal that several organizational factors have been identified for successful e-government. Relevant organizational factors that require close attention would be following:

**Financial resources:** In a developing country like India, one of the most critical factors is financial resources. Without a proper financial backup even a good plan will fail. To come up with an effective portal a strong financial support is required for manpower, machinery and communication (Chen et al., 2007; Iacouvo et al., 1995; Kannibiran & Banumathi, 2008; Zarei et al., 2008).

**Top management support:** Support of top level management is a key success factor for most new initiatives in an organization, whether they are technology related or not. There are a considerable number of studies that underscore the role of
top management support as one of the
deciding factors for the success of any
IT endeavour (Kambil et al., 2000, Eder & Igbaria, 2001). Many authors suggest
that leadership commitment is a key chal-
lenge for the success of any knowledge
management initiative (Venkatesh et al.,
2003; Wang, 2003; Fu et al., 2004; Chang
et al., 2005).

**Technical Expertise:** Chen et al. (2003) put
forward that IT skill set is one of the
factors affecting adoption and diffusion
of innovations for e-business systems. In
addition, Anurag Srivastava, IT Direc-
tor of Madhya Pradesh, India (Personal
communication, April 13, 2009) states
“A skilled person with an experience in
developing portal can easily understand
the requirements of the portal and also
can help in adopting new technologies”.
Availability of skilled manpower is a ma-
jor concern. As a result most governmen-
t department in India finds it difficult to
successfully implement an e-government
project.

**Strategic goals:** Development of portal has
various stages (Layne & Lee, 2001) and
hence, it is essential to have a proper stra-
tegic plan to achieve each level of portal.
Lack of clarity will lead to an improper
infrastructure which will further lead to
unsatisfactory results.

**Promotion efforts:** People are often unaware
of the availability and usefulness of the e-
government projects. Adequate training is
necessary for the end users to make them
understand the benefits of e-government
(Brown, 2003; DeLone & Melea, 2003;
Garson, 2003). As stated by Neeta Verma,
Senior Technical Director, NIC, India
(Personal communication, August 08,
2007), “if the users are unaware of the
services provided by the portal then the
portal will not be fully utilized”. Hence,
awareness of the portal’s utility among
the citizens is requisite.

**Internal motivation:** It is essential to have
both vertical and horizontal integration
within and among different Government
departments to achieve one-stop portal.

“At present in some departments of India
vertical integration is being achieved.
But to achieve horizontal integration a
full support from various departments is
required” (Janmejay Thakur, Principal
System Analyst of Indian Government
Tenders, India, Personal Communication,
March 3, 2009; Neeta Verma, Senior
Technical Director, NIC, India, Personal
Communication, August 8, 2007). Thus,
every government organization must be
encouraged for integration.

**Collaborative mindset:** The level of trust that
exists between the organization, its sub-
units, and its employees greatly influences
the amount of knowledge that flows both
between individuals and from individuals
into the firm’s portal (Delong & Fahey,
2000). Many a times the people who are
important viz. boss, peers, subordinate
do not support the use of e-government
(Brown & Brudney, 2003; Edmiston,
2003; Gupta et al., 2005; Heintze & Bretschneider, 2000; Holden et al., 2003;
La Porte et al., 2002; Venkatesh et al.,
2003). Therefore, attention should be paid
to the supporting norms and behavioural
practices that manifest trust as an impor-
tant organizational value.

**IT maturity:** If the level of IT maturity is high
then fewer efforts are required to achieve a
one-stop portal as high IT maturity means
higher user awareness, good IT planning,
good IT usage history etc. (Benbasat et
al, 1980). Furthermore, if the level of
IT maturity is low then more efforts are
required to achieve one-stop portal. In
addition, in firms with a high level of
IT management maturity, top manage-
ment may be expected to have greater
knowledge about IT and participation
in IS planning (Johnston & Carri, 1988;
Lederer & Mendelow, 1987; Sabherwal
& King, 1992)

**Security apprehensions:** Security is not only
a technical issue but also a prime orga-
nizational factor. For any portal security is one of the biggest concerns (Layne & Lee, 2001). E-government users are concerned about the security (Petrovic, 2004; Seifert & Relyea, 2004; Suh & Han, 2003) & privacy related issues, which have also been raised by several authors (Andersen & Dawes, 1991; Moon, 2002; Reddick, 2009).

The organizational factors have either positive or negative connection between them and this is described through a Causal loop diagram (Figure 2). The top management support plays an essential role in achieving the level of integration. Strong top management support will identify and focus on strategic goals which will further raise the demand for technical expertise. Enhanced top management support along with strategic goals and technical expertise will motivate integration of information with other departments. Hence, this will improve the level of integration. Once the level of integration is achieved less support from top level management is required (balancing – B₁). There is also a negative feedback of Integration and financial resources (B₄). When the level of integration is low then need for financial resources increase and as the level of integration increases the need for financial resources will decrease. Conversely with high level of integration, the issue of security rises. Therefore, more security measures necessitate as the level of integration increases and vice versa (Reinforcing feedback loop – R₁).

In addition there are two loops with top management support. Top management will improve collaborative mindset and have a positive feedback (R₂). Greater IT management maturity can be characterized by top management support and their awareness of the organization’s long-term strategic plans (Cash et al., 1992; Earl, 1993; Sabherwal & Kirs, 1994). This will further lead to integration (B₂). Promotion of portal utilities can also help in achieving integration. For this promotion needs to be a part of strategic goals (B₃).

5. DIMENSIONS OF INTEGRATION

With an aim to attain an interoperable Government portal, high degree of Integration is required among back offices. According to Vernadat (1996), integration can be divided into dimensions. In this study integration is divided into three dimensions: Data Integration, Process Integration and Communication Integration. For each dimension different factors have been developed. The factors have been formed from studies in the literature and discussions with high-ranking government officials, webmasters and IT professionals working on portal development in various government departments of India. Hiller and Bélanger (2001), in particular, stress increasing levels of data integration for true transformational e-government but warn that such data integration raises significant privacy issues when the data involve personally identifiable information. According to Neeta Verma, Senior Technical Director of NIC, India, (Personal Communication, August 8, 2007) in order to achieve any of the three dimensions of integration an appropriate architecture forms the basis. Further she adds that data centres are required for e-governance applications and portals. Ajay K. Singh, Director of Centre for Railway Information Systems, India (Personal Communication, February 28, 2009) states, “For any integration, compatibility of the existing technologies is the initial step”. “Security is the prime concern” pointed by Navin Mittal, Collector, Andhra Pradesh, India (Personal Communication, February 12, 2008). Hardeep S. Hora, Technical Director of NIC, India (Personal Communication, March 7, 2009), concludes that out of the three dimensions the maturity level of process integration is the lowest in India.

E-government interoperability can be achieved through the adoption of standards –“agreement among independent parties about how to go about doing some task” (Bloomberg & Schmelzer, 2006; Furlong, 2008) –or through architecture –“the fundamental organization of a system embodied by its components and their
relationships to each other and to the environment, and the principles guiding its design and activity” (IEEE, 2006).

**Data Integration**

Data integration is an issue of combining data residing at different sources and providing the user with a unified view of this data (Halevy, 2001; Srivastava et al., 1996). There are factors that constitute Data integration. Table 2 provides an overview of studies from literature and experts consulted that have considered factors to provide a better understanding of data integration.

*Data centre:* In Government there are multiple diverse data sources: Unstructured data that lies in the form of rules, procedures and concepts, guidelines etc; Data referring to facts and figures treated as operational idea; and Structured data which is derived from information that can be stored in computerized form database and further be used for decision making (Gupta et al., 2005). In order to handle diverse data a suitable data centre is required where the relevant data can be stored and managed (Neeta Verma, Senior Technical Director of NIC, India, Personal Communication, August 8, 2007; Navin Mittal, Collector, Andhra Pradesh, India, Personal Communication, February 12, 2008; Mirulesh, Public Works Department, Delhi, India, Personal Communication, March 7, 2009).

*Data architecture:* Neeta Verma (Senior Technical Director of NIC, India, Personal Communication, August 08, 2007) and Anurag Srivastava (IT Director, Madhya Pradesh India, Personal Communication, April 13, 2009) testified about their views: with an appropriate data centre the need for integrated data arises to combine all relevant data accessible through data. As proposed by IEEE (2006) architecture for combining all relevant data is necessary where all the databases from different Government departments can be integrated.

*Data update:* The data of Government organizations change on a regular basis. For example: Increase and decrease in number of birth rates, death rates, change in ad-
addresses etc. Therefore, a regular update of data is crucial (Shefali Dash, Deputy Director General, NIC-HQ, India, Personal Communication, January 28, 2008; K. N. Narayankar, Senior Research Executive, Central Water & Power Research Station, India, Personal Communication, March 17, 2008).

Compatible standards: In India, incompatible standards are used for maintaining information by every organization separately. This makes data sharing unmanageable. For this reason sharing data with other organizations compatible standards have to be adopted (Ajay K. Singh, Director, Centre for Railway Information Systems, India, Personal Communication, February 28, 2009; Ahmed, a Software Programmer, Finance Commission of India, Telephonic Communication, March 19, 2009). For example, a residential address might be stored in 10 unconnected computer systems. If the technologies are not compatible then there will not be flow of information. Adoption of compatible standards will not only save time but also will be cost effective (Layne & Lee, 2001; Rao et al., 2008; Santos & Reinhard, 2007).

Back office integration: Discussed with Dibakar Ray (Scientist, National Informatics Centre, India, Personal Communication, October 10, 2007) and U.C. Nangia (Director, Ministry of Petroleum & Natural Gas, India, Personal Communication, May 22, 2009) back office integration is mandatory for a citizen centric portal. For example, citizen enters change of address once and this information is saved by all the other integrated departments. This will improve customer service and provide faster response time (Hiller & Belanger 2001; Mach et al., 2006; Santos, 2008).

Data security: The organization’s portal must adopt mechanisms for data security (Anurag Srivastava, IT Director, Madhya Pradesh, India, Personal Communication, April 13, 2009; Mittal, Collector, Andhra Pradesh, India, Personal Communication, February 12, 2008; Jacob Victor, Joint Director (E-governance), Andhra Pradesh, India, Personal Communication, February 15, 2008) and hence, support cryptography, authentication, firewalls, etc. to safeguard corporate information and prevent unauthorized access. The ability to secure access to diverse range of resources with incompatible security controls is an enormous challenge for portals (Eckerson, 1999).

Specialized technologies for supporting metadata (data of data) are required to accomplish data integration. With literature review and discussions with IT professionals in India (Table 2) the following technologies are found significant for data integration:

- **Ontology:** Ontology is made capable to ‘describe metadata’ in order to build one complete glossary that will clearly define the data found in the World Wide Web (Weng & Tsai, 2006). The reason ontologies are becoming so popular is largely due to what they promise: a shared and common understanding of some domain that can be communicated between people and application systems (Ding et al., 2002). With colossal government data need for shared domain occurs.

- **Open Standards:** Proprietary standards can sometimes be expensive and it may be cost prohibitive to purchase access to a proprietary standard if it is ever needed (The Open Group, 2005). The use of open standards can help assure interoperability of diverse systems, reduce the risk of vendor lock-in and guarantee data preservation. Three key characteristics of open standards identified by Coyle (2002) are 1) that anyone can use the standards to develop software, 2) anyone can acquire the standards for free or without a significant cost, and 3) the standard has been developed in a way in which anyone can participate.
• Data Replication: Data replication is a process of maintaining a defined set of data in more than one location. It involves copying designated changes from one location (a source) to another (a target), and synchronizing the data in both locations (IBM, 2008). Data replication provides support for automated real time data synchronization enabling locality of access for data access regardless of source implementation (E-Governance Standards, n.d.). This technology alleviates back office integration for portal.

• Data Transformation: Both structured and unstructured data must often undergo considerable transformation before it can be used by applications. Data transformation enables the translation of data information to support data cleansing and metadata interchange through leveraging industry standards. Some of the open standards that facilitate data transformation are: ANSI SQL, XML (Chen, 2003). EDI standards: UN/EDIFACT, including ANSI X.12 (E-Governance Standards, n.d.).
• **Message Formatting Language:** The Message Formatting Language is used to define the format of data messages and business documents that can be exchanged between applications. This includes defining the standards for the data exchange between the parties. The involved parties can be the internal Government organizations as well as outside agencies (E-Governance Standards, n.d.).

• **Data Modelling:** Data Modelling defines the conventions to be used for representation of system and data models among all the internal government departments. Data modelling is used to provide the conceptual design primarily for human interpretation. UML (Unified Modelling Language) is the most widely used standard for defining and exchanging the data schema and data model. UML has been supported by lots of case tools, designing tools and software testing products (E-Governance Standards, n.d.).

• **Data Resource Description:** Data Resource Description (RDF) defines the language for representing metadata. Metadata commonly defined as data about data, relates to a set of attributes that will capture the semantics of individual data items. Each element contains information related to a particular aspect of the information resource and metadata describes the technical aspects of information resources. (E-Governance Standards, n.d.).

The relation between factors of Data Integration is illustrated through causal loop diagrams (Figure 3). Loop B₁ is balancing feedback loop which shows that the need for an adequate data centre increases as the level of data integration decreases. With an appropriate data centre the requirement for data security will also increase.

Once the level of integration is achieved the need for data centre will decline – hence, balancing loop. Along with data centre, the technical aspects (Ontology, Data replication, Data modeling, RDF) and updating data becomes necessary (Loop B₂ and B₃). An adequate data centre will lead to adoption of open standards which will further make the software versions compatible (Reinforcing – Loop R₁). Additionally, architecture for combining data will be formed if appropriate data is available in data centre. This architecture will increase Integration of service delivery departments and this will further enhance data centre (Reinforcing loop – Loop R₂). Same as in loop B₁, an increase in factors will improve the level of integration. Considering the level of data integration is achieved the need for adequate data centre will reduce.

### Process Integration

For inter-organizational integration the necessity for process integration increases. Hardeep S. Hora, a Technical director of NIC, Ministry of Tribal Affairs, India (Personal Communication, March 7, 2009) points out that different processes are developed for every level of government organizations. Hence, integration of these processes is essential. The factors of process integration are also derived from reviews and discussions with Indian IT professional that are illustrated in Table 3.

**Process codification:** In government organizations every function involves a process. For portal improvement it is important that all the processes are defined and classified. For example applying for passport, a citizen has to undergo a process and further each process has sub processes like verification of personal details etc. Thus all these processes need to be formed and organized (Liu et al., 2005).

**Formulation of processes:** Integration of all the processes whether internal or external in a portal is necessary. Internal integration includes all the integration aspects within one organization. External integration covers all the possible integration patterns across multiple organizations (Ghattas & Soffer, 2008; Wittenburg et al., 2007). Continuing with the same example of
applying passport, the different processes like verification of personal details, status update etc. need to be integrated.

Process update: Once the processes are codified and integrated, there is a need for update. Like data, processes also change in Government and so updating of processes is crucial (Ceravolo et al., 2008, Wittenburg et al, 2007). For an example: In a government department, the information is flowing vertically and then later the information flows horizontally. For this either the process is modified or a new process is adopted. Navin Mittal, Collector, Andhra Pradesh, India (Personal Communication, February 12, 2008) concludes that updating is required.

Reuse: Software reuse is the process of implementing or updating software systems using existing software assets (Department of Defense, 1996). A good software reuse process facilitates the increase of productivity, quality, and reliability, and the decrease of costs and implementation time. An initial investment is required to start a software reuse process, but that investment pays for itself in a few reuses.

Middleware: Middleware allows the semantic description, publishing and updating of life events in order to provide citizens with an up-to-date and personalized list of available services; allows the description, identification, instantiation and invocation of services (Gugliotta et al., 2005). It is optional to include middleware in the eGIF as there are other frameworks available that have features of both middleware and back office integration.

Open standards: Adoption of open standards for combining the processes. As discussed in the last section the use of open standards can help assure interoperability of diverse systems as it avoids the use of vendor lock.

Figure 4 shows the causal loop diagram for the factors which effect Process integration. Loop B₁ is balancing feedback loop which shows for process codification, formulation of all the processes is essential. Further, if the processes are well formulated an architecture with technical aspects has to be formed. This will in return increase the level of Process Integration. Process codification will deteriorate after the achievement of process integration. Loop B₂ is again a balancing loop.

Technical aspects (Middleware) demands open standards. Open standards will acquire process of implementing or updating software systems using existing software assets (reuse) and update. Formation of technical aspects reduces the requirement of open standards – hence balancing loop.

Communication Integration

Communication integration comprises the use of electronic computers, computer software and computer networks to convert, store, protect, process, transmit and securely retrieve information. A set of factors for achieving success inter and intra departmental integration are drawn from the literature and interviewing experts and are presented in Table 4.

Networking: Network architecture is the design of a computer network. It includes the design principles, physical configuration, functional organization, operational procedures, and data formats used as the bases for the design, construction, modification, and operation of a communications network. It outlines the products and services required in data communication networks. For an interoperable portal efficient network architecture is essential.

Connectivity: In government departments’ enormous data is stored and shared. With this the requirement for high bandwidth applications, such as live digital reference continues to increase. For instance if a department sends crucial information to another department and the connectivity is slow then it will consume time (Strover, 2001).
Quality of service: A communications network transport a multitude of applications and data, including high-quality video and delay-sensitive data such as real-time voice. According to Huang et al., (2006) and Ardagna and Pernici (2006), networks must provide secure, predictable, measurable, and sometimes guaranteed services. Achieving the required Quality of Service (QoS) by managing the delay, delay variation (jitter) and packet loss parameters on a network becomes essential. Thus, QoS is the set of techniques to manage network resources (CISCO).

Web and internet technologies: Governments worldwide are increasingly using the Internet to provide public services to their constituents (Layne & Lee, 2001). Much of the research has focused on practical and technical dimensions while research on how to improve e-government for users remains scarce (Bertot & Jaeger, 2006). Web-based technologies offer governments more efficient and effective means than traditional physical channels to better serve their citizens (Evans & Yen, 2006).

Interoperability of technologies: Technical compatibility corresponds to the extent of fit of the new technology with existing data and telecommunications infrastructure (Lin & Lin, 2008). Lin and Lin (2008) concluded that incompatibility of new technologies with existing values and work practices is one of the greatest inhibitors in IT implementation. Thus, when organizations perceive e-government as compatible with existing beliefs and work practices, they are more likely to be positively predisposed to promoting its successful diffusion.

Security: Another concern of the portals is the security of the network. Straub and Nance (1990) remark, “people frequently misuse hardware, programs and computer services”. Each of these have specific risks that involves the vulnerability of information system assets to attacks from information system threats, where
a “vulnerability” can affect an IS asset negatively (Rainer et al., 1991).

**Intelligent design**: The devices and channels that access applications can be of multiple types. Therefore, for an application to be accessed by different access channels, it needs to be intelligent enough so that it can convert the contents to a format that is understandable by the device or the channel medium accessing. Applications that can support all the formats are becoming essential. This will not only make the portal flexible but also reachable to most of the citizens (E-Governance Standards, n.d.). For example, citizens using the portal utilities from mobile phones etc.

**Network Layer Security**: Network layer security standards deal with the security at the network level. These standards are relevant when for implementing virtual private network (VPN) and secure remote access. The most common standard used for this is Internet Protocol Security (IPsec), which provides a mechanism for securing IP. It is the security standard at the network layer for communication (E-Governance Standards, n.d.).

Figure 5 shows some negative (balancing) and some positive (reinforcing) feedback loops for factors of communication integration. With a decrease in level of communication integration the need for networking increases which require deployment of web and internet technologies. Level of networking can be improved by better connectivity and good quality of service. Therefore, there is a positive relation between networking, connectivity and quality of service (Reinforcing – R1). There is an upward reinforcing feedback loop R2 between deployment of web and internet technologies and intelligent design for multiple accesses. For example, with an increase with deployment of web and internet technologies there will be an increase in intelligent design for multiple accesses. Further a strong networking and adequate

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**Table 3. Studies and discussions on factors of process integration**

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<tr>
<td>Liu et al., 2005</td>
<td>Ahmed, Software Programmer, Finance Commission of India; Huzur Saran, Professor, Department of Computer Science and Engineering, IITD, India; Ajay K. Singh, Director, CRIS, India,</td>
<td>Process codification</td>
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<tr>
<td>Ghattas &amp; Soffer, 2008; Wittenburg et al., 2007</td>
<td>Anurag Srivastava, IT Director, Madhya Pradesh, India; Hardeep S. Hora, NIC, India; Huzur Saran, Professor, Department of Computer Science and Engineering, IITD, India; Ajay K. Singh, Director, CRIS, India,</td>
<td>Formulation of processes</td>
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<tr>
<td>Ceravolo et al., 2008; Wittenburg et al., 2007</td>
<td>Ahmed, Software Programmer, Finance Commission of India; Navin Mittal, Collector, Andhra Pradesh, India</td>
<td>Process update</td>
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<tr>
<td>DoD, 1996</td>
<td>Shefali Dash, Deputy Director General, NIC-HQ, India; Jacob Victor, Joint Director (E-governance), Andhra Pradesh, India</td>
<td>Reuse</td>
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<tr>
<td>Gugliotta et al., 2005; Liu et al., 2005</td>
<td>Neeta Verma, Senior Technical Director, NIC, India; Janmejay, Principal System Analyst, Indian Government Tenders, India</td>
<td>Middleware</td>
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<td></td>
<td>Hardeep S. Hora, technical director of NIC, India; D. C. Mishra, Senior Technical Director, NIC, India</td>
<td>Open standards</td>
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deployment of web and internet technologies will lead to the demand of interoperability of existing technology.

As discussed earlier security remains a concern with every dimension. With an increase in the level of interoperability, the necessity for security measures increases (Balancing feedback loop B). Thus all the factors help in achieving communication integration. This will further decrease the need for improved networking.

6. SYNTHESIS AND DISCUSSION

One of the key objectives under the e-government agenda is to achieve a one-stop government portal so that the user is able to access integrated public services through a single point even if these services are actually provided by different departments or authorities. One stop portal requires interoperability and will be achieved after a totally integrated presence stage. Totally integrated presence stage refers to the situation in which government services are fully integrated (vertically and horizontally) (Hiller & Bélanger, 2001; UN & ASPA, 2002). In this stage, governments undertake institutional and administrative reforms that fully employ the potential of information technologies (Grönlund, 2001).

Fully integrated services require complete integration of its dimensions i.e. data, process and communication. To do so different determinants of the dimensions need to be identified. It has been shown that these determinants are not mutually exclusive and thus are related to each other in some way. The three dimensions are also inter-connected and development of one dimension will affect the growth of the other two dimensions.

Information system researchers need to monitor this phenomenon and make contributions where applicable. The estimation of level of integration in three dimensions for electronic government provides a comprehensive structure for organizations to succeed in portal development at all levels. Constant technological change often weakens the value of legacy systems, which have been developed over the years through huge investments. Organizations struggle with the problem of modernizing these systems while keeping their functionality intact. The adoption of interoperability supports the integration of legacy systems for e-government.

For an integrated service, organizational factors play a significant role. Without a strong organizational support no technical aspect can be achieved. Therefore, both organizational as well as the technical factors are mandatory for achieving an interoperable portal. Organiza-
### Table 4. Review on factors of communication integration

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<tr>
<td>Ronald Nororha, Chief Manager, BPCL, India; Mirulesh, Web Developer, Public Works Department (Delhi), India</td>
<td>Networking</td>
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<tr>
<td>Strover, 2001</td>
<td>R. Vijaya Chakraboraty, Senior Manager (Systems), National Aluminium Corporation Limited, India</td>
<td>Connectivity</td>
</tr>
<tr>
<td>Huang et al, 2006; Ar-dagna &amp; Pernici, 2006; CISCO, 2006</td>
<td>Naveen Agrawal, Technical Director (IT), Department of Land Resources, India; U.C. Nangia, Director, Ministry of Petroleum &amp; Natural Gas, India</td>
<td>Quality of services</td>
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<td>Layne &amp; Lee, 2001; Bertot &amp; Jaeger, 2006; Evans &amp; Yen, 2006</td>
<td>Jacob Victor, Joint Director (E-governance), Andhra Pradesh, India; Janmejay, Principal System Analyst, Indian Government Tenders, India</td>
<td>Web and internet technologies</td>
</tr>
<tr>
<td>Lin &amp; Lin, 2008</td>
<td>Anurag Srivastava, IT Director, Madhya Pradesh India Shefali Dash, Deputy Director General, NIC-HQ, India Dibakar Ray, Scientist, NIC, India</td>
<td>Interoperability of technologies</td>
</tr>
<tr>
<td>Straub &amp; Nance 1990; Rainer et al., 1991</td>
<td>Vinay K. Chaudhary, Engineer, Power Grid Corporation, India; Mittal, Collector, Andhra Pradesh, India</td>
<td>Security</td>
</tr>
<tr>
<td>IFEG Version 2.4 Report (2005)</td>
<td>Naveen Agrawal, Technical Director (IT), Department of Land Resources, India; U.C. Nangia, Director, Ministry of Petroleum &amp; Natural Gas, India</td>
<td>Intelligent design</td>
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#### Figure 5. Causal loop diagram for communication integration
tional factors are the inputs that have an impact on the outputs i.e. technical factors. Likewise all the dimensions are interconnected and major interrelations are shown in Figure 6. Loop $R_1$ is a reinforcing feedback loop which shows that an improvement in the organizational factors will improve technical factors i.e. the dimensions of integration and the reverse is true as well. For example, an appropriate data centre plan will not be possible without support from top level management. Also if there is a top level management support but there is lack of skilled manpower, the problem of appropriate data centre will still remain.

Within the technical aspects, the three dimensions of integration: data, process and communication are in a reinforcing feedback loop ($R_2$, $R_3$ and $R_4$ loops). An increase in level of integration of any dimension will have a positive feedback on other two dimensions. Hence, increase the level of integration of other two. Similarly the lower level of integration of any dimension will lower the level of integration of the other two dimensions. For example with a weak network backbone, data and process integrations cannot be achieved as the information will not be able to flow. For vertical and horizontal integration an improvement in all the three dimensions is essential along with organizational factors. Lower level of any of the three dimensions will require more efforts in achieving the point of interoperability.

### 7. conclusion And future work

The purpose of this paper is to examine interoperability adoption within an organization context. There is an attempt to formalize a way to locate an organization in interoperability adoption space based on an organization’s “sophistication levels” of its current level of integration and factors. An interoperability adoption framework proposed by Chen (2003) has been followed. The framework helps organizations to examine their current status in the e-government environment from the perspective of three domains, namely data integration,
process integration and communication integration. The framework also provides guidelines for government organizations who need to understand the potential benefits of adopting interoperability technology and then assists them in choosing the appropriate path and proper applications. Considering the current status of its IT applications, an organization can utilize this model to measure the efforts/costs that will be incurred by developing its interoperability enabled applications.

The contribution of this paper is twofold. First, determinants of integration along three dimensions—Data integration, process integration and communication integration have been identified. Studies from literature and discussions with experts exhibit that both technological factors and organizational factors effect the development of government portal. The higher level of integration and organizational factors, the more advanced is the government portal development. Second, all the dimensions along with organizational factors are inter-connected and this has been illustrated by causal loop diagrams.

As future work, the adoption model can be used for other technologies such as enterprise architecture and enterprise architecture integration that being adopted these days. Enterprise architecture (EA) is particularly relevant to organizations that have a large portfolio of applications where problems such as functional overlap, duplication and redundancy are common. EA therefore encompasses the interconnectedness of IS applications, and the degree to which individual IS applications need to be integrated. Enterprise application integration (EAI) refers to ‘the plans methods, and tools aimed at modernizing, consolidating, integrating and coordinating the computer applications within an enterprise’ (McKeen & Smith, 2002). EAI represents an alternative to “point to point” integration in which the multitude of direct interfaces created between individual IS applications often results in “spaghetti” integration. At technology level, EAI involves the development of messaging middleware, an integration broker that serves as a hub for inter-application communication, and adapters that allow applications to interface to the integration broker. Integration brokers also perform additional functionality such as data translation, messaging logic and transaction management.

While interoperability future looks bright, and several government organizations in India have adopted it, there still exists the question of whether or not it will reach critical mass. It is our opinion that this will happen; however, we cannot speculate when, be it in one year, ten years, or ever. Furthermore, the dimensions in this paper are identified primarily based on studies from literature and discussions with experts and experience with e-government initiatives in Indian government portals. However, the underlying theory of this adoption model shall be applicable to other governments as well. The dimensions and there factors are not constrained and can be further developed according to the requirements for portals.

REFERENCES


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The RFID Technology Adoption in e-Government: Issues and Challenges

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Bhasker Mukerji, St. Francis Xavier University, Canada

ABSTRACT

The emergence of Radio Frequency Identification (RFID) technology has affected the functions and roles of business organizations. RFID technology provides technical solutions across a variety of industries in the public and private sectors. E-government is being increasingly utilized by governments in different countries to increase the efficiency of services provided to citizens. Although the use of e-Government is allowing timely, effective services online, many challenges must still be overcome to maximize the utility e-Government can provide to citizens. RFID is disseminating in a variety of new areas and movement exists toward the adoption of RFID in e-Government, but several issues and challenges must be addressed. This paper examines both e-Government and RFID from an individual perspective and explores the possible issues and challenges associated with RFID technology adoption in e-Government. Based on a review of literature, a conceptual model has been developed illustrating the various issues and challenges and how they would impact the RFID adoption in e-Government.

Keywords: e-Government, e-Government Services, Efficiency, RFID, RFID Adoption,

INTRODUCTION

Radio frequency Identification (RFID) technology has become a hot topic in the fields of supply chain management and manufacturing. RFID has emerged as part of a new form of inter-organizational system that focuses to improve the efficiency of the processes in the supply chain. Business organizations started taking a hard look at what RFID can do for them and whether they should give further consideration to adopting RFID technology, because it is a technology dramatically changes the capabilities of an organization to acquire vast array of data about the location and properties of any entity that can be physically tagged and wirelessly scanned within certain technical limitations (Coltman et al., 2008). RFID allows any tagged entity to become a mobile, communicating component of the organization’s overall information infrastructure. According to the market research analyst IDTechEx (Das, 2005), the cumulative sales of RFID tags for the year 2006 reached over 2.4 billion and RFID smart labels would be needed in a range of areas, such as retailing, logistics, animal and farming,
library services, and military equipment. It has become a novel and exciting research area of technological development, and is receiving increasing amounts of attention from the researchers as well as practitioners.

According to experienced early adopters, and academic researchers, RFID facilitates collaboration between organizations (Cantwell, 2006; Lekakos, 2007). In an e-Government context, RFID provides boundless potential in improving effectiveness, efficiency, and tracking e-Government services much more accurately in real-time reducing processing time delays. A number of factors have led to RFID being utilized more in e-Government. The emergence of common practice standards, the rising appearance of information technology infrastructure, technological advances and the importance of real-time intelligence have prompted a surge in the popularity and use of RFID. The different applications of RFID technology have experienced success in various fields, especially in business and many new developments for further RFID use are in the works (Wyld, 2005).

This paper explores the processes in e-Government where RFID technology could be applied and discusses the benefits of this technology in providing value added e-Government services to citizens. The next section begins with a concise overview of e-Government literature, followed by a technical background of RFID. The benefits of RFID are discussed, followed by the findings of how RFID influences the various areas of e-Government services. Following the literature review, a conceptual model for RFID adoption in e-Government is given illustrating the various issues and challenges and how they would impact the RFID adoption in e-Government. Research propositions are evolved from the model and suggested for further research. Finally, the limitations and the areas for further research are discussed followed by concluding remarks.

LITERATURE REVIEW

E-Government

E-government is the application of electronic means to simplify, and improve the technology-mediated interaction between government and e-governance community comprised of citizens, civil society organizations, private companies, government law makers, and regulators on networks to increase the administrative effectiveness and efficiency in the internal government operations (Marche & McNiven, 2003; Toregas, 2001; Tapscott and Agnew, 1999). E-government is about moving government services online (Finger & Pecoud, 2003; Waishanen, 2002; West, 2001) by providing easy to navigate and access web portal to all online government services (Lloyd, 2002) in an interactive manner (Alcock & Lenihan, 2001). The potential benefits are: speed, efficiency, convenience, public approval, democratization, and environmental bonuses (Hanson, 2009; Sinrod, 2004). The three main domains of e-governance are (Heeks, 2009; Prattipati, 2003): improving government processes (e-administration), connecting citizens (citizens and e-services), and building external interactions (e-society).

E-governance satisfies the citizen as customer by making use of Information and Communication Technologies (ICT) to exchange information and services with citizens, businesses, and other government agencies (Deakins & Dillon, 2002; Heeks, 2002; Okot-Uma, n.d.) to bring Simple, Moral, Accountable, Responsive, and Transparent (SMART) governance (e-Governance online). The two key e-governance goals are: good governance of ICTs; and putting ICTs to the service of good governance.

E-government is also seen as a decisional process. E-government Institute of Rutgers University states: “E-governance involves new channels for accessing government, new
styles of leadership, new methods of transacting business, and new systems of organizing and delivering information and services. Its potential for enhancing the government process is immeasurable”.

E-governance is a powerful tool in the hands of Government. Commonwealth Center for e-governance says: “E-governance is the commitment to utilize appropriate technologies to enhance governmental relationships, both internal and external, in order to advance democratic expression, human dignity and autonomy, support electronic development and encourage the fair and efficient delivery of services”.

Though e-Government gained a significant frequency of use, it has not yet gained widespread acceptance. This is because skeptics of e-Government have laid out potential risks of this new system dramatically outweighing its benefits (Heeks, 2009). Some of the risks are hyper-surveillance, cost implementation, inaccessibility, and false sense of transparency and accountability. The risk behind the hyper-surveillance is that as citizens begin to interact with the government electronically on a large scale it could result in a lack of privacy. The money that has been poured into the development of e-Government, its results have been sub-par (Atkinson, 2008). Inaccessibility risk may be due to a significant portion of the population unable to access the e-Government resource. Since the government controls e-Government, information can be added or removed without public notice and this causes concerns of false sense of transparency and accountability.

RFID Technology

The term RFID is generally used to describe any technology that uses radio signals for identification purposes which, in practice, means any technology that transmits specific identifying numbers using radio (Garfinkel & Rosenberg, 2006). Over the years, RFID has been used in a variety of applications, such as inventory management, anti-theft monitoring of consumer merchandise, and the tagging of livestock. Boeck and Wamba (2007) describe an RFID system as follows: “an electronic tag containing historical, transactional or identifying data are affixed to or embedded in an object”. By using an RFID reader, the data are automatically downloaded wirelessly to a computer. Once on the computer, the information can travel anywhere that is accessible by the internet or on a private network. Considered as a wireless technology, RFID not only refers to the tag containing a chip, but also to an antenna for sending and receiving data in order to communicate with an interrogator called reader (Bendavid et al., 2008). The communication is done through radio frequency with the tag and the RFID system has a middleware that manages, filters, aggregates and routes the data captured (Asif & Mandviwalla 2005). Accordingly, RFID is a wireless tracking technology (Karkkainen & Holmstrom, 2002) that allows a reader to activate a transponder on a radio frequency tag attached to, or embedded in, an item, allowing the reader to remotely read and/or write data to the RFID tag (Curtin et al., 2007). RFID is considered advantageous over traditional bar-coding methodologies because it is not considered by “line-of-sight” and multiple tags can be read simultaneously by available readers in the vicinity (Lefebvre et al., 2006; Vlosky & Wilson, 1994). The origin of this technology goes back to its military applications during the Second World War, when British Air Force used this technology to distinguish allied aircraft from that of enemy aircraft with radar (Asif & Mandviwalla, 2005). In the business scenario, the RFID system in integrated with enterprise systems such as warehouse management systems, enterprise resource planning system, and may be combined with other technologies such as global positioning system (GPS).

The structural rudiment of this technology can be broken down into the tag, the reader, and surrounding computing technologies. RFID tags are the chips that are embedded in the product, pallet, or case that store and transmit information about the specific item it is attached to. Tags are made of a hard copper coil consisting of an integrated circuit attached to an antenna.
then packaged into a housing device appropriate for the application (Delen et al., 2007). Data is stored on the integrated circuit and transmitted through the antenna to the reader by either a passive or active tag. Passive tags are generally more popular, less expensive, with a virtually unlimited lifespan. They use radiated energy from an electromagnetic field that RFID readers generate to transmit information, and will only remain energized while it is within the reader’s field of range. Active tags are self powered by a battery and act as a miniature computer and transmitter that receives, stores, and transmits information to the reader about a product. Active tags life span is limited; however the tags do have a longer read range, better accuracy, more complex rewritable information storage, and richer processing capabilities (Bhuptani & Moradpour, 2005). Readers are transmitters and receivers governed by a microprocessor or digital signal processor that communicates with the tags within its field. They use a manufactured antenna to seize data from the tags passing the data to a computer for processing. These readers can have an effective range from anywhere to a few inches to a many meters depending on the frequency and type of tag being used. Data collected from the tags by the reader is then passed through wireless transference to host computing technologies for interpretation, storage, and action by the organization utilizing RFID technology.

A CONCEPTUAL MODEL FOR RFID TECHNOLOGY ADOPTION IN E-GOVERNMENT

As costs of RFID technology come down and use becomes more widespread, RFID technology can be successful in addressing or improving some of the issues faced by the e-Government. As RFID is a useful technology which provides technical solutions across a variety of industries to increase efficiency within each of these sectors, e-Government is attempting to adapt RFID to cater to the requirements of the society and to improve processes. In spite of substantial benefits in proving efficient and effective e-Government services, today’s RFID adoption is still limited in e-Government environment due to barriers such as (i) lack of maturity in RFID technology (e.g. read rate, data reliability, high rate of new hardware and software introduction, lack of unified standards for interoperability), (ii) relatively high costs related to hardware, software customization, systems configuration and integration, and training, (iii) RFID Technology Acceptance (iv) security issues (i.e. data access, privacy and legislation), (v) lack of expertise (i.e. specialized skills required for RFID implementation) and (vi) patent challenges (i.e. EPC global’s intellectual property (IP) policy and concerns about royalty costs) (Asif & Mandviwalla, 2005; Wu et al., 2006; Li et al., 2006). Despite the growing prevalence of RFID applications, researchers have only recently started to examine these issues, challenges, and factors for RFID technology adoption in e-Government. Building upon the e-Government and RFID literature, this research presents a conceptual model for RFID technology adoption in e-Government, as presented in Figure 1. This model is comprised of issues, challenges, and factors for RFID technology adoption in e-Government.

RFID Technology Maturity

RFID is not yet well known technology for the e-Government because at present RFID is still in its infancy and the policy makers and civil servants do not fully understand the potential of it. Some critics may say that the RFID is a new way of doing old things. There is no central body of RFID knowledge and there is no mechanism for sharing the RFID implementation best practices. Another limitation of RFID technology implemented in an inter-organizational/ inter-governmental network is conflicting standards that may prohibit the deployment of the technology and abate anticipated effectiveness and efficiency across the network. Accordingly, the interoperability of solutions as well as the RFID technologies is limited. There is a need to align the frequency usage of RFID so that
the RFID system can interoperate in different countries (Soon & Gutierrez, 2008) on a global scale. The adoption of divergent RFID technologies undermines the interoperability of tags and readers across a global network, maintaining the perceived benefits of effectiveness and efficiency at the business process level. In summation, mandating the alignment of a global RFID technology standard is essential to perpetuating international interoperability of RFID technology across an inter-governmental network.

Another use of RFID which could be an e-Government application which is in the inception stage is the development of a "Smart Cane" for helping blind people. Using RFID and being equipped with an ultrasonic sensor, the smart cane works in tandem with a navigational system inside a bag. A speaker on the bag tells the person when there is an obstacle in the way and so the person can navigate their way around with little trouble. If equipment like this becomes more wide-spread it will have ramifications on e-Government as it will help improve social services available to citizens with disabilities. The developers of the smart cane from the University of Central Michigan are optimistic that this technology can be standardized in the future. This would go a long way in the empowering of those with disabilities as well as create cost advantages as these technologies come down in price with further production.

These examples presented above are just a handful of the RFID initiatives being experimented with. Many other applications are being developed to improve processes or address problems in society but most of them are in the inception stage. Initiatives are being taken to address issues such as national identification, vehicle identification, document security, food safety, waste management, infant protection, drug pedigree, medication administration, blood banking and surgical objects tracking, to name a few more. Through the above examples it is quite evident that RFID and e-Government collaborations are in somewhat of a beginning stage. Though there have in fact significant breakthroughs in this area, only the tip of the iceberg is seen so far. RFID and e-Government have a much greater potential for changing the way we live, but the technology is not being put to full use. The reasons are: it is a new innovative technology with high risks, costs and many skeptics. This discussion provides the basis for Proposition P1.

P1: The RFID technology maturity due to its introductory level negatively influence its adoption in e-Government.
Implementation Cost of RFID Technology

Though access to shared information is at the heart of an RFID initiative, in RFID applications where large numbers of tags are used and then disposed of, the running cost of the tags is a central issue. Cost is often mentioned as one of the main barriers of RFID implementation. However, as demonstrated in the field, an initial inherent level of trust and investment that government bodies will not try to bypass the RFID system is necessary if it is to be effective. Implementing the RFID system will initially necessitate a considerable amount of investment in specific areas. There are two types of costs involved – an initial capital cost and an operating cost (Jayaraman et al., 2008). The initial costs would include the cost of setting up the infrastructure for reading the RFID tags. These costs can include RFID readers, the cost of software that handles the interface between RFID readers and the existing system and the cost of training the workers on the use of new system. The operating costs would include (i) the cost of the RFID tag itself (ii) the cost of tagging each item and (iii) the cost of maintaining the RFID readers, and the software upgrades.

A portion of this investment therefore represents sunk costs that will not be recovered. The various cost ingredients of RFID technology implementations (Hellstrom, 2009) are as follows: (i) hardware (tags, readers, process units, and antennas) (ii) Servers and cables (iii) system integration cost (for hardware installation, software development, and software installation) (iv) initial cost of investment (replacing the existing hardware, and application software) (v) system maintenance cost (includes software license, software development, operating the system, and running cost). Accordingly, system integration, the number of readers and the process of applying the tags are issues which in themselves may involve higher costs than the cost of the tags. The cost and benefit of implementing RFID technology in e-Government depend on each specific situation. Consequently, each situation requires its own specific cost–benefit analysis. For example, the US Department of Defense (DOD) has also been using RFID technology to help transform its extremely complicated supply chain (Roberti, 2009). The DOD purchases items such as bullets, airplanes, drugs, tents, food, light bulbs, and laptops on an almost daily basis. On top of that, many of these items are shipped to different locations throughout the world. The DOD’s radio-frequency in-transit visibility (ITV) Network is an active RFID-based cargo-tracking system with nodes in about forty countries and over 4000 locations. It tracks an average of 35,000 supply shipments around the world each day. The Department of Defense has increased efficiency and reduced waste by employing active RFID tags in its containers. Between 2010 and 2015 the Department of Defense estimates a budget of about $875 million towards continuing and expanding its use of RFID tags. The above discussion provides the basis for Proposition P2.

P2: The implementation cost of RFID technology negatively influences its adoption in e-Government.

RFID Technology Acceptance

Gaining the e-citizen’s acceptance of RFID technology is another important challenge to implementation success as ensuring technological integrity. This suggests that e-Government administration bodies should view RFID application and usage as an ‘identification & tracking’ issue for detecting human activities (Smith et al., 2005; Smith, 2006, Arellano, 2008) rather than one strictly of technology or economics. Perceived usefulness and perceived ease of use are two widely recognized IT implementation success factors (Davis et al. 1989). Training and communication are two important managerial interventions to influence the acceptance of IT (Amoako-Gyampah & Salam, 2004). For example, the most personal application of RFID technology is the human-implantable RFID chips. These are used for a variety of authentication uses, such as authorizing use of...
computers, car door and building locks, and even recreational uses such as preferred entrance into nightclubs (Foster & Jaeger, 2007). Especially these chips were required for implantation by some employers who employ people for high-security positions (Verichip, n.d.). Besides, the VeriChip corporation start producing both implantable chips and wrist bracelets for storing health information and tracking patients in hospitals (Verichip, n.d.). In 2007, the company collaborated with a nursing home to implant chips in patients and ended up with the issue of forced implantation (Biever, 2007). Though the RFID bracelets are useful for identification and tracking, when the patients remove them without accepting the technology, the whole purpose of the proposal will be defeated. This discussion provides the basis for Proposition P3.

P3: The e-citizen’s acceptance of RFID technology affects its adoption in e-Government.

Security and Privacy Issues

The innovative RFID technology is not without its limitations. It presents some potential security issues to users when the communication between the tags and the reader is exposed to skimming, eavesdropping and tracking (Meingast et al., 2007). When external entities have read access to the tags or related databases with confidential data, data may become compromised during wireless transmission. Skimming occurs when the data on the RF transponder is read without the owner’s knowledge or consent using an unauthorized reader. Eavesdropping is the opportunistic interception of information on the chip while the chip is accessed by a legitimate reader. By reading the static information on a transponder, storing it, and following its signal, an unauthorized user can track the transponder and in return, track the individual. The tag security is vulnerable because the data stored is plain text or unencrypted. Besides, encrypting the data requires more space on the tag that results in higher costs, increased processing time, and a larger chip and thereby increasing the requirements for the actual size of the tag (Puffenbarger et al., 2008). Some of the RFID vendors have addressed these security issues by encrypting the actual data transfers.

For instance, a major collaboration between RFID and e-Government that has already begun taking effect in some nations is the issuance of e-passports (Fontana, 2006). These are also known as biometric passports. Currently the United States has a “Passport Card” that uses a simpler form of RFID instead of the contactless smart technology that is used for biometric passports. Fingerprint recognition, facial recognition, and iris recognition are different ways of identification that biometric technology uses for passports and other similar types of ID. This would increase efficiency and speed at the airports, making check-in time and boarding much less of a hassle for people flying. Though various governments have launched the programs to ensure safety and protection for e-passports, there have been a few loopholes in each system. Professional hackers have found ways to bypass these securities and have successfully read passport information, replicated passports (Zetter, 2006), and even changed some passport information (Reid, 2006). The six pieces of information that can be stolen from the RFID chip on a U.S. passport are: passport holder’s name, nationality, gender, date of birth, place of birth, and a digitized photograph (Broache, 2006). There have also been several security and privacy concerns that have come to light. Lab demonstrations have shown that a successful eavesdrop on an RFID tag can occur at a distance of one meter (Hancke, 2008). So, many security experts are questioning whether RFID enabled e-passports have enough security built in to survive hackers and protect e-passport users from data theft and other security and privacy intrusions (Fontana, 2006). A threat analysis of RFID passports is given by Ramos et al. (2009) in which authors discuss about the technology and cost requirements for perpetrators attacking the RFID passports.

In case of e-passports, Identity theft is an additional risk. In case of storing unencrypted personally identifiable information on a transponder, such as a name or credit card number,
an unauthorized entity can steal this personal data and use it for identity theft (Meingast et al., 2007). Privacy concerns with RFID technology are vast, unauthorized persons can read RFID-tagged items from a safe distance, and most consumers are not aware of the tags or that the items are being tracked. In some cases, cloning may occur when an adversary makes an identical clone of the data on the RFID responder. This clone can be used instead of the original transponder without the user’s knowledge. Accordingly tags can potentially be used to identify unique individuals and then be able to automatically locate them in public places. To protect consumer privacy, strategies are being formulated. For instance, EPC (Electronic Product Code) global has developed standard as a way of addressing public opposition of RFID privacy concerns. Consumer notice, consumer choice, consumer education, record use, retention, and security are included among these standards. Consequently, security and privacy questions have not gone away as many experts are saying that it is not the e-passport is inherently unsecure but that some recently demonstrated hacks and the inevitable advancement of technology such as an increase in RFID antenna power show that the e-passport may not weather its 10-year life span (Fontana, 2006).

Another example is the issuance of RFID enabled licenses (Songini, 2007). The State of Washington is the first U.S. state to partner with the Department of Homeland Security to offer an “Enhanced Driver’s License” (EDL) to state residents beginning in January of 2008. The EDL is used to denote identity and citizenship at land and sea border crossings, and incorporate passive ultra high frequency (UHF) RFID technology for remote readability (typically read at ranges up to thirty feet) at ports of entry. After reading the data, the EDL will transmit an identification number to the reader in order to authenticate the license holder in DHS databases. While this eliminates the risk of reading personally identifiable information still presents cloning and tracking risks to the card holder. These EDLs are useful for frequent border crossers and some of these cards are purpose specific and could be carried only when the cardholder anticipates crossing the border, while driver’s licenses are used for primary identification. The plan for using RFID technology in the new licenses drew criticism since an RFID-laced ID card can transmit personal information to anyone with the right reader device. Based on the above discussion, this study derives Proposition P4.

P4: Security and privacy concerns related with RFID technology negatively influence its adoption in e-Government.

Availability of Management Expertise on RFID Technology

Drawing on prior research on the RFID benefits realization, one of the most critical barriers is the lack of leadership vision, management vision, and commitment for the role of RFID technology in e-Government. There may be some notable exceptions, as we have discussed in this paper. For example, RFID technology’s ability to track the movement of specific assets has great potential for use in response operations during chaotic disasters. Currently geographic information systems (GIS) provides the government with infrastructure and evacuation routes, but the locations are static and do not show the changing locations of objects and people as well as RFID does. This is a new technology that is currently under debate by many governments. It has not yet been fully employed but there are many who believe that it will be highly advanced and beneficial for disaster preparedness and recovery. The overall goal of this implementation is to reduce the threat to the community during a disaster such as tsunami, hurricane, or tornado. RFID has helped and improved businesses in terms of management coordination and efficiency. It is believed that RFID can be applied to an evacuation/disaster response just as it applies to business. The management and coordination will be improved by real-time, location-aware information about people and assets available through the use of
RFID (Chatfield et al., 2009). Once the RFID technology is applied in a particular disaster then a similar could be developed and applied to other disasters such as earthquake, wildfire, drought, extreme temperature, storm, flood, and so on. Millions of dollars of damage are being caused by natural disasters. This does not include the social cost of individuals who lose their homes and loved ones. It is believed by experts that these losses can be dramatically reduced by applying RFID to disaster response and relief.

For instance, Texas is the first state government to employ an RFID – enabled emergency evacuation system (the Texas Special Needs Evacuation Tracking System, SNETS). SNETS has been tested and was successful in three simulated evacuations but has not yet been fully adopted, nor does it currently have an e-Government link. Here are the two major challenges faced by the Texas Government (Chatfield et al., 2009): (i) the diffusion of the SNETS by regional hospitals and emergency medical professionals and (ii) the integration of the SNETS with e-Government service to share real-time information with concerned families and relatives about evacuation. Though there is evidence supporting the usefulness of RFID for disaster relief, there is currently a lack of leadership, vision and awareness in this field. Texas is an example of RFID’s slow emergence in society today.

Besides, RFID has been started using in more sensitive areas such as supply chain security of nuclear materials (Tirschwell, 2009). The United States Department of Energy has been taking steps towards adapting RFID into its current system to monitor nuclear materials. RFID has been used for tracking and monitoring nuclear materials for many years now, but there have recently been significant developments in this technology. The National Laboratory for the Department of Energy has upgraded its current RFID applications. It can now monitor the environmental and physical conditions of containers of nuclear materials in storage and transportation. With nuclear materials, health and safety issues have always been a major topic for concern. When nuclear materials are not properly monitored it can lead to both environmental hazards and human casualties. With tens of thousands of different radioactive materials dispersed throughout a country, government agencies have always had great difficulty in ensuring public safety. With this newly developed system, all data dealing with the history of any nuclear container is readily accessible and can be found with the click of a mouse. The Department of Energy plans on expanding the use of this RFID technology to other hazardous materials, such as containers in chemical plants. This is a perfect example of how government is using RFID to benefit the public sector (through increased safety) and its agents (the Department of energy being able to monitor all aspects of hazardous containers).

Developing the RFID technology management expertise becomes so important and military is the first mover on this issue (Tirschwell, 2009). Based on the above discussion, this study derives Proposition P5.

P5: Lack of technology management expertise in RFID technology negatively influences its adoption in e-Government.

ISSUES FOR RESEARCH

There are several research issues that should be addressed to advance both researchers and managers understanding of the concept of RFID adoption in e-Government. The components given in the model may not be an exhaustive list for RFID adoption in e-Government and, as a result, it becomes necessary to identify other components. Research is needed to study the cost of adopting RFID for different stages of its adoption. The organizational readiness is another factor to be considered for RFID adoption. For example, Canada and the United States are among the most ready countries accepting RFID, so there are possibilities for becoming leading innovators of using RFID technologies in e-Government. There are many other areas in the public sector that could benefit from RFID and many others that have already implemented
RFID that could further benefit from it. The future research should explore the new areas for RFID applications in e-Government. One such area is using RFID by provincial/federal governments to assess their citizens’ living requirements such as water, power, services, and other basic amenities. For this purpose, the e-citizen must be registered as a “citizen” in a provincial/federal database. Either in the SIN card or something similar RFID chip will be installed. In this context RFID technology can be used for both identification and tracking purposes. When the e-citizen registered with a province, the registered information including the service requirements will be transmitted into the personal RFID chip. In a similar database there will be services offered at a particular provincial government. With a cross-referencing of these databases, the provincial government can assess the exact type/amount of services required by each/all citizen(s). The usage of RFID technology benefits both the government administration body as well the e-citizens. For the government, there would not be any burden of oversupply of its services that would be lowering the variable cost of e-Government services. The citizens get benefitted because there will be prompt supply of e-Government services (e.g., renewal of driver’s license, power, water requirement etc.).

Public safety is a very important issue to both the government and citizens. RFID can be used to improve the public safety. For instance, for the past several years, there have been talks of placing RFID chips in both convicts (that are in jail) and pedophiles. If this does happen there will be extra precautions that can be taken to further protect citizens from the anti-social elements. Both homes and businesses have alarm systems that are either motion censored or detect break-ins; an addition feature would be detecting certain RFID chips, namely the ones of escaped convicts. Collaboration between security companies and government criminal databases would be essential for this to work. For example, if a convict goes to jail, (s)he would have an RFID chip implanted in him/her; this would be mandatory. If the convict tries to escape (and authorities could not apprehend him/her quickly enough) and run towards, let us say someone’s home that had this additional feature, the alarm would automatically be set off by the escapee RFID chip.

RFID applications in e-Government could benefit the banking sector also. For instance, applying for a loan, whether it is for a house or any type, often can be a lengthy process. Applying, being accepted, and receiving the money can take several days or weeks. If banks, e-Government and RFID work together it could make this lengthy, time consuming process more efficient with quicker results. In databases, the government would keep track of all citizens’ purchases, their credit rating, insurance, debt and so on. An RFID chip containing all this information could be placed into a credit card or some sort. If an individual wishes to get a loan, by bringing this card to a banker, the loan application would be immediately approved or rejected for a specific amount, and are given immediate access to the funds. This is another way in which e-Government, RFID could collaborate to benefit both the private and public sectors of a society.

Another issue for future research is the importance of the “people” component for RFID adoption in e-Government. The important actors who have to carry out the tasks of RFID adoption include end-users (e-citizens), planners (e.g. RFID technology providers, vendors etc.), and top management (provincial/federal governments). Research is therefore needed to develop an integrated perspective of RFID adoption in e-Government by combining the views of all the stakeholders impacted.

**IMPLICATIONS AND CONCLUSIONS**

In conclusion, in adopting RFID technology in e-Government, priorities are to be set in order to address the challenges and issues associ-
ated with RFID technology. Having said the challenges of adopting RFID technology, what role should government play in dealing with them would be a critical factor for successful adoption of RFID technology. The government organizations need to understand that RFID is not a goal but the means to achieve identification and tracking for efficient and effective services to the citizens. Best practices in adopting this technology in an e-Government context are to be explored by further research and the knowledge needs to be shared among the governmental bodies. Educating the policy makers of a government regarding the usage and benefits of RFID technology becomes paramount initiative for successful adoption. The education campaign can also include the topics such as why RFID is necessary for the e-Government and what rights and protections are afforded to citizens. For having more confidence on security in RFID adoption, the governments have to obtain and incorporate feedback from security experts and citizens.

REFERENCES


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