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## TECHNOLOGICAL AND ORGANIZATIONAL CHALLENGES IN E-GOVERNMENT MATURITY: A LITERATURE REVIEW

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## **Abstract**

This article identifies the technological and organizational challenges faced by public organizations as they move through different stages of maturity of e-government. We use the concept of maturity stages of e-government to analyse and categorize the technological and organizational challenges. Research done in this area tends to focus essentially to have an outward look, to focus on what the constituencies can do with the service, while here we focus on the internal factors, on how the services can be provided. We are interested in the state of the art of what is actually known about the challenges faced by the internal public administration as they become more matured in their e-government efforts. The purpose is twofold: for research to identify avenues for future research and for practice to provide a condensed guideline for personnel and organizational development for IT and HR managers or even mayors of municipalities.

## **1 Introduction**

The use of Internet by public authorities to provide services to citizens is nowadays quite widespread. The provision of public services through the internet is widely known under the generic label of electronic government or e-government. Given the potential of e-government services to increase level of service, decrease costs, and increase the citizens participation in the public sphere, the issue of evolution of e-government in particular has been treated quite extensively especially in Europe in response to the European strategy (European Council, 2000) to make Europe the “most advanced knowledge economy in the world”. One way to guide this evolution has been to create roadmaps for the evolutions of the services. However, while increasing the services increases the demand and ergo creates a virtuous cycle for the citizens, it also increases the complexity of managing the service internally for the service providers.

In discussions on the evolution of services and e-government maturity with public servants in municipalities we have realized that they face a number of challenges in their effort of increase the amount of electronic services and level of maturity. E.g. for them a major source of uncertainty

was the issue of who had the responsibility to carry out certain activities or take certain decisions as the type of services changed and evolved.

The existing literature dealing with the internal effects of providing electronic services mainly focuses on the efficiency gains that the municipalities can experience (Reddick, 2005; Layne et al., 2001) but it is not clear on how these advantages can be obtained. The vast majority of the existing literature on e-government has instead an outward focus: (1) the services provided to the citizen (e.g. Moon, 2002; Torres et al., 2005); (2) the use of the services by the citizens (e.g. Reddick, 2004; Koh et al., 2005); (3) the relations between the public authority and its interlocutors (e.g. Hiller et al., 2001; Siau et al., 2005) (4) the evolution of the services (e.g. Layne et al., 2001; Baum et al., 2000) (5) the importance of the technologies used (e.g. Gi-Garcia et al., 2005; Brewer et al., 2006).

The research on internal challenges, changes, requirements and effects of providing certain electronic services and assuring their evolution is instead sparse and scattered throughout different research studies. In our literature review we found various maturity models and each focused only on some aspects of internal management and organization (Baum et al., 2000; Hiller et al., 2001; Moon, 2002; Layne et al., 2001; Keng Siau et al., 2005; Ronaghan, 2001; Wescott, 2001) but none of them goes in depth with the technological and organizational challenges connected to the different stages of maturity. On the other hand, articles focusing on the internal technological challenges (e.g. Garson, 2003; Dawes et al., 2002) or internal organizational challenges (e.g. Gil-Garcia et al., 2005; Barret et al., 2001) do not take into consideration the different maturity stages of e-government, but deal with challenges regardless of the type of electronic services offered or of their evolution.

The paper will address therefore the following research question: which are the internal technological and organisational challenges faced by governmental organizations in the different stages of e-government maturity?

This question will be answered through a literature review which will present the state of the art of what is actually known about the challenges faced by public administrations as they become more mature in their e-government efforts.

This paper is organized as follows: in section 2 we outline of our research methodology; in section 3 we provide an overview of e-

government maturity models; in section 4 we present the internal technological and organizational challenges found in the literature. Finally we discuss our future avenues of research and implication for practice.

## **2 Methodology**

In this research we have focused on papers dealing with maturity models because this stream of research deals specifically with the evolution of services and the challenges faced in their management.

We have identified one such maturity model that seemed to be highly cited in the literature (Layne et al., 2001) and we have carried out a citation analysis to identify how many authors had developed it or developed new models (Webster et al., 2001). We have also identified if other models were cited by this literature and we have carried out citation analysis for these models as well. All analysis was carried out using the database EBSCO Business Source Complete without limiting our research to a specific methodology, one set of journals, or one geographic region of the authors or cases. The Layne and Lee (2001) (L&L for short from now on) article was cited 34 times since its publication (according to EBSCO). Having identified the 34+1 articles we carried out a backward reference analysis to make sure that all relevant articles had been identified. The backward search allowed us to identify 7 additional maturity models before or around the publication date of L&L and 5 subsequent ones. The result of this search is presented in fig. 1. The scrolls in fig. 1 indicate articles that presented maturity models.

After having identified the models, from each article we have extracted the issues related to technological and organizational challenges. To complete the research we have however also screened the general e-government literature (130 articles found in EBSCO using search words: e-government, electronic government, organizational change and e-government, technological change e-government, period 2000-2008) to gather additional information. The main contribution of this second content analysis was the identification of challenges not connected to specific stages of maturity of e-government but portrayed as generic key issues in e-government initiatives. These contributions have allowed us to specify these key challenges for the specific stages. As we were reviewing the

articles we stopped finding new concepts and this gave us the signal that we were nearing the completion of our search (Webster et al., 2001).

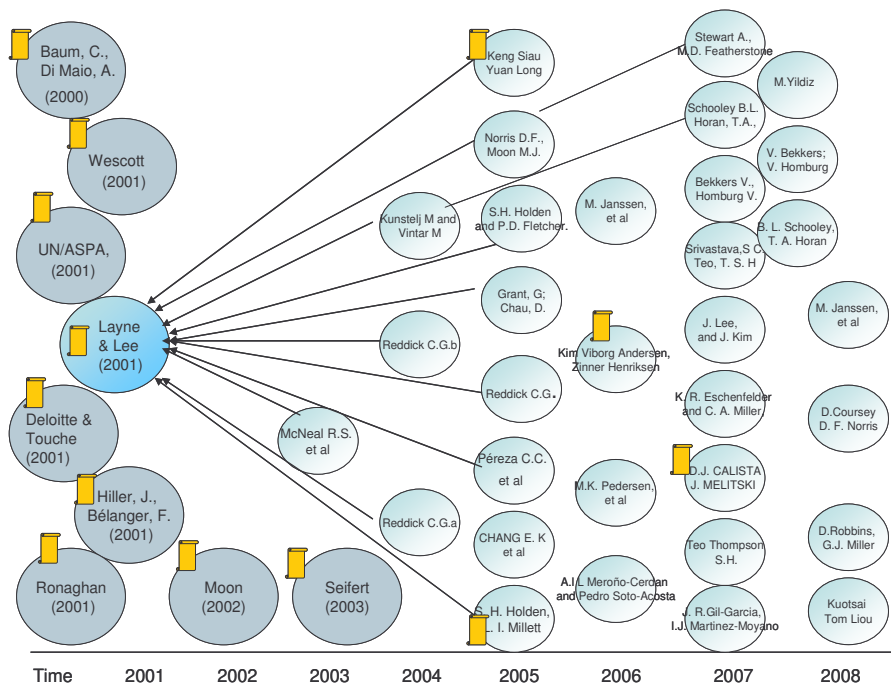


Fig. 1. Citation network for e-government maturity

### 3 E-government Maturity and Research Framework

E-government is broadly defined as using ICTs to help service delivery (Bekkers et al., 1999). E-government services provide efficiency and effectiveness (Heeks, 2001b), they facilitate interactivity (DiCaterino et al., 1996), and create a networked structure for interconnectivity (McClure, 2000). In some cases e-government is defined as utilizing specifically Internet and the World-Wide-Web for delivering government information and services to the customers (UN & ASPA, 2002). This should happen 24/7 and the “customer” can be a citizen, a business or another government entity. E-government is therefore defined by the objective of the activity, the specific technology used, the provider of the service/ information, and the activities or needs of the related actors. However most definitions of e-government gloss over the specific context, regulatory environment,

dominance of a group of actors in a given situation, and different priorities in government strategies (Torres et al., 2005). Since our interest is namely on of what happens within the public organization we intend e-government as: *The services provided through ICTs to multiple stakeholders and whose provision and evolution may require changes in the organizational structure, competences and mindset of public employees.*

It is widely acknowledged that organizations move through different stages of maturity, with periods of evolutions and revolutions (Greiner, 1972). Maturity models describe the category of models that show the evolution of the services proposed by public offices through ICT. They describe different stages of e-government development based mainly on the idea that increasing technological complexity allows providing better services to the constituencies but requires higher skills for the employees: hence the use of the word *maturity*. Different declinations of maturity models have been created in the academic world as well as at international level, for example by the European Union (2005), the Worldbank (2001), and the Australian National Audit Office (2001).

Layne and Lee (2001) argue that e-government begins with what they call cataloguing, or the basic provision of mostly static information online. They predict that e-government will then move to a transactional stage. Up to this point, their model is substantially similar to the other models reviewed here. From this point, however, Layne and Lee's model diverges from the other models. It predicts that the third stage of e-government will be vertical integration, which involves upper and lower levels of government sharing data and information online. The final step in Layne and Lee's model is horizontal integration, which means the sharing of data and information online across departments within governments.

Baum and Di Maio (2000) propose a maturity model very similar to L&L. Baum and Di Maio (2000) have however a more outward look as for them transformation means that e-government will cause or permit the relationship between citizens and governments to fundamentally change in positive ways, generally producing much more citizen-centric and responsive government and thereby increasing citizen trust in government dramatically (Coursey, et al., 2008).

Hiller and Bélanger's (2001) model suggests a slightly different progression than the other models and also predicts a somewhat different end point. Stages one and two in this model are similar to those in most

models: information followed by two-way communication (interactivity). Hiller and Bélanger predict that the third stage will be the integration of data and information within and among governments. Integration is followed by a transactional stage, and Hiller and Bélanger predict that at its end point, e-government will enable or produce e-participation. In this model, e-government is clearly expected to evolve to a higher plane at which citizens participate electronically in the very activities of governance. Despite some minor differences in phrasing, Moon (2002) adapted Hiller and Belanger (2001) five-stage model (Information: dissemination, catalogue; two way communication; service and financial transaction; vertical and horizontal integration; political participation).

The models offered by Ronaghan (2001) and Wescott (2001) present models similar to L&L and differentiate essentially in the last stage which they call *seamlessness*. This involves both the horizontal and vertical integration of governmental information and services, and it is a condition that permits citizens to access such services regardless of the type or level of government in which the information or services are located. These models are being used, with very small variation by the United Nations and American Society for Public Administration (UN/ASPA) (2001).

Deloitte's (2001) proposed a six-stage model with focus on the technology used to support the stages: security in transactions (stage 2) and portal (stage3), customizable portal (stage 4) and seamless interaction with multiple agencies (stage 5). For them the last stage is an ideal vision in which governments provide sophisticated, unified, and personalized services to every customer according to their own needs and preferences.

In 2005 Siau and Long presented a maturity model with five stages: web presence, interaction, transaction, transformation, e-democracy. This model is also in the same line as the others and assumes that more services demand more skills. They focus on the changes necessary to go through the stages indicating re-engineer existing processes to reduce bottlenecks and intermediaries. They consider e-democracy a long-term goal for e-government development. By offering tools such as online voting, polling and surveys, governments attempt to improve political participation, citizen involvement, and politics transparencies.

These models all predict the linear, stepwise, and progressive development of e-government. See table 1 for comparison of the different models and the different phases they are including in their models.

Normatively, these models also tell us that “the more e-government the better” but it also requires more experience.

Tab.1.Comparison among the maturity models of e-government

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
<b>Layne and Lee (2001)</b>		Catalogue	Transaction	Vertical Integration	Horizontal Integration	
<b>Baum and Di Maio (2000)</b>		Presence	Interaction	Transaction	Transformation	
<b>Ronaghan (2001)</b>	Emerging presence	Enhanced presence	Interactive	Transactional government	Seamless	
<b>Wescott (2001)</b>	E-mail and internal network	Enable interorganizational and public access to information	Two-way communication	Exchange of value	Digital democracy	Joined-up government
<b>Hiller and Belanger (2001)</b>		Information dissemination	Two-way communication	Integration	Transaction	Participation
<b>Moon (2002)</b>		Information: dissemination, catalogue	Two way communication;	Service and financial transaction;	Vertical and horizontal integration;	Political participation
<b>UN/ASPA (2001)</b>	Emerging web presence	Enhanced web presence,	Interactive web presence,	Transactional web presence	Seamless web presence	
<b>Deloitte &amp; Touche (2001)</b>	Information publishing/ dissemination	“Official” two-way transaction	Multi-purpose portals	Portal personalization	Clustering of common services	Full integration and enterprise transaction
<b>Keng Siau and Yuan Long (2005)</b>	Web presence	Interaction	Transaction	Transformation	E-democracy	

In our effort to classify the technological and organisational challenges in different stages of e-government maturity we will base the rest of the discussion on a four-stage model inspired by L&L.

We do not consider the first phases presented in some models (Ronaghan, 2001; Deloitte&Touche, 2001 et al.) because they do not require any organizational adaptation or technological interventions; also we do not investigate the 6th phases presented in some models (Moon, 2002; Wescott, 2001 et al.) since empirical research has shown that no public organization is in this situation (Norris et al., 2005). Again using content analysis we identified hints of technological and organizational challenges identified by the authors – when these were not explicitly described.

As stated in the research question we want to identify the internal technological and organizational challenges that governmental organisation are facing at different maturity level.



By technological challenges we refer to the changes in technology required to move from one stage of e-government to another. The provision of e-government requires a variety of technologies as per its definition. The ICTs in use involve, in addition to the Internet and the Web, technologies such as database, networking, discussion support, multimedia, automation, tracking and tracing, and personal identification technologies (Jaeger, 2003). In some forms, ICTs have provided e-government services long before the internet became public. A classic case is represented by the networks and databases used for public registry purposes in most European countries. The technological challenges faced by public officials involve decision making for how the technologies should evolve and under whose control. While keeping in mind that the guiding rationale is the purpose served, still decisions have to be made on the mix of ICTs in use. This mix may include internal databases and private networks, databases and independent hosted website, databases integrated with external website etc. So the technological challenge is not only in being able to decide on increasingly complex technologies but also on being able to discern and prioritize in which technologies to invest in and how to best exploit the legacy systems.

By organizational challenges, we refer to the changes processes required, designed, or emerged in the organization of a municipality to accommodate the provision of services via ICT. E-government entails a certain degree of virtualization of the work functions that may appear in form of virtual agencies, cross-agency networks, and public-private networks whose structure is highly connected to the characteristics of the enabling technology (Fountain, 2001). Therefore as public offices move through different stages of maturity they need to structure in a way to best exploit the technological possibilities. This may involve the creation of a dedicated IT function, setting up agreements with external providers, outsourcing the management of IT. It may also involve extending the function of non-IT employees that more and more will experience IT as being core component of their work and co-producer of their results. This requires setting up processes that involve IT both for the provision of services and for their evolution. The design of the organization as well as the management of the changes required forms therefore the organizational challenges.

## **4 Internal technological and organisational challenges**

In the following we are going to outline the stages with the related technological and organizational challenges emerged from the literature study. Each stage will be concluded with a summary table.

### *4.1 Stage 1*

In the first stage efforts are focused on cataloguing government information and presenting it on the web (Layne et al., 2001). The first stage of growth represents the initial effort of governments to establish an online presence. Cataloguing involves presenting information about government and its activities on the Web. At this stage, the information is non-transactional in nature (Reddick, 2004). In this stage, governments typically post simple and limited information through their web sites, such as the agency's vision and mission, office hours, contact information, and official documents. The main difference between this stage and other higher stages is that in this stage, governments only provide information on the web sites and no interaction is possible (Siau et al., 2005). In this phase the need for codification of information and integration with other sources is very low. A Web presence reduces the workload of street level bureaucrats and the associated cost because it is a functional equivalent to providing information 24/7 (Fountain et al., 2001; Reddick, 2004a; Layne et al., 2001). The indication of the literature is that most cities in Europe provide today at least stage 1 services (Cap Gemini Survey 2007; Reddick, 2004). Surveys conducted within the past six years (ICMA/ PTI 2000 and 2002; Norris et al., 2005) show that relatively few local governments in the United States at any level and of any size have developed truly sophisticated e-government offerings. Most e-government services in the United States as recent as in 2005 (Norris et al., 2005) were principally informational: static information pages, downloadable forms, and e-mail.

#### **4.1.1 Technological Challenges**

The technology enabling stage 1 can be, and usually is, relatively simple (L&L). Contact information provides citizens a way to access areas of

expertise by pointing them to a specific department of interest or to an individual expert (Reddick, 2005). Websites at this stage function as a rudimentary form of a knowledge directory (Reddick, 2005). Typical functions are: menus, search options, hyperlinks to related sites, news, and sometimes the use of profiles and subscription options (Janssen et al., 2008). The main technical challenge in this stage – and for today’s standards – is planning the navigation from a piece information to another in a way that is user friendly and that the layout is appealing.

#### 4.1.2 Organizational Challenges

In case of basic use of technologies than organizational challenges are limited (Layne et al., 2001). Implementing basic technologies to support informational services does not require changes in the organizational structure of the public office nor of the roles or skills of the employees. Most often the structure of an informational website is simple enough to be created and managed by the local IT expert. This person is also normally the one that maintains the content of the pages prompted by the employees in the departments.

In this stage the public offices have the chance to create a culture for the use of on-line services in the functions. They can do that with ease since offering these services does not really require other changes.

Tab. 2. Technological and Organizational challenges in the first stage of e-government

<b>Stage 1</b>	<b>Technological challenges</b>	<ul style="list-style-type: none"> <li>• <i>Technology is relatively simple</i> → L&amp;L, 2001</li> <li>• <i>Static or basic information</i> through web sites → Siau et al., 2005; Reddick, 2005</li> <li>• <i>Typical functions</i>: Menu structure, search options, hyperlinks to related sites, news, and sometimes the use of profiles and subscription options → Janssen, et al., 2008</li> <li>• <i>Is a rudimentary form</i> of a knowledge directory → Reddick, 2005</li> </ul>
	<b>Organizational challenges</b>	<ul style="list-style-type: none"> <li>• <i>Organizational challenges are limited</i> → L&amp;L 2001</li> <li>• <i>The structure doesn't change</i> → L&amp;L, 2001</li> <li>• <i>The roles don't change</i> → L&amp;L, 2001</li> <li>• <i>Culture creation</i> → Ho, 2002</li> </ul>

## 4.2 *Stage 2*

In stage 2 e-government initiatives focus on connecting the internal government system to on-line interfaces and allowing citizens to carry out transactions. In this stage public services allow the on line systems to interact with the databases so that citizens can pay taxes, fines, or fees (e.g. school, doctor, library), can fill government forms, renewing visas, obtain passports, and update birth and death records (Siau et al., 2005). The major focus in stage 2 is integration with existing databases and security of transactions.

Public services in stage two see the citizen more as a customer (Layne et al., 2001) but the public sector must maintain equity, which translates into parallel processes, virtual and physical, since not all citizens have access to the Internet.

### 4.2.1 Technological Challenges

Carrying out transactions on the Web requires a substantially increased level of information exchange between the government and citizens. Existing electronic databases may need to be reprogrammed to handle these exchanges and in most cases there needs to be a form of user identification (Layne et al., 2001). In turn, the information required for transactional services demands much higher degrees of data security and integrity. In this area new technologies such as the digital signature and security keys have been developed to identify univocally the users (Deloitte&Touche, 2001). Many public service are migrating towards the use of electronic signatures but the great majority still relays on home made identification systems. Transactional system may require, already in this stage, integration of data from different sources (e.g. personal data and bank data). This poses the problem of data transparency and compatibility.

### 4.2.2 Organizational Challenges

Organizational challenges are much greater in this stage. (Layne et al., 2001). Problematic issues identified include organizational and human

resources management issues (Lee et al., 2007). To resolve these problems, attention need to be paid to (1) the change management dealing with fast pace of technological development, (2) the consensus building among government authorities as perceptions vary widely, (3) the process-wise integration among departments and agencies, (4) the demand of different types of IS/IT-related training among government employees.

The way in which public offices can deal with these questions depends greatly on their size: for large offices the answer is in the creation of IT departments and for smaller offices in outsourcing (Reddick, 2004 b). In both cases there is the need for increasing the general technical skills of staff and to dedicate specific roles to support on line initiatives. One example of this is to create specific roles for IT project managers (Barki et al., 1993) and for e-government champions (Teo et al., 1998).

Tab. 3. Technological and Organizational challenges in the second stage of e-government

<b>Stage 2</b>	<b>Technological challenges</b>	<ul style="list-style-type: none"> <li>• Database Reprogrammed → L&amp;L, 2001</li> <li>• Increased information exchange → Koh, et al. 2005</li> <li>• Increased data security → Koh, et al. 2005</li> <li>• Need for identification → Deloitte&amp;Touche, 2001</li> </ul>
	<b>Organizational challenges</b>	<ul style="list-style-type: none"> <li>• Creation of IT department → Reddick, 2004</li> <li>• Outsourcing of IT development → Reddick, 2004</li> <li>• Recognition of IT specialized personnel → Lee et al., 2007</li> <li>• E-government's Champion → Teo et al., 1998</li> <li>• Use of change management → Lee et al., 2007</li> <li>• Consensus → Lee et al., 2007</li> <li>• Wide IT Training → Lee et al., 2007</li> <li>• Risk → The rewards to the risk takers as IS/IT initiatives require immense amount of risk taking (Lee et al., 2007).</li> </ul>

### 4.3 Stage 3

Stage 3 refers to the vertical integration between local and state governments (Layne et al., 2001): linking municipal government's systems

with higher levels of government in similar functional areas (Reddick, 2004a). Typical functions found at this stage are: subscription, alerting, life-events, business-events, integrated forms for requesting products from multiple organizations (Janssen et al., 2008). In some cases this is achieved through the use of a portal that in many larger cities facilitates vertical and horizontal interaction in municipal government (Ho, 2002).

The main interest behind vertical integration is that if a citizen conducts a transaction with a state agency, this will be propagated to local and federal counterparts (Layne et al., 2001). Here we beginning to talk about a one-stop portal in which users can immediately and conveniently access all kinds of available services (UN's five-stage model, 2001). Because of the integration, the scope of activities performed by each employee will extend beyond departmental boundaries (Layne et al., 2001). Integrated service delivery implies that several back offices should work together in handling questions, requests, security, privacy, etc.

#### 4.3.1 Technological Challenges

Stage 3 is characterized by heavy use of IT and by the need to design reliable cross-level processes (Layne et al., 2001). The performance of cross-agency processes depends on the performance of the weakest link. A failure of one subsystem might disrupt the whole cross-agency process and result in a loss of data or an information integrity problem because data in different systems might have different states. Rather than automating and digitalizing current operational processes, this stage moves towards transforming the way that public offices provide services. As we move to stage 3 e-government initiatives should be accompanied by re-conceptualization of the government services. The exchange and sharing of information and knowledge between these back offices implies the integration of several information domains, each with its own legal framework, its own information systems, its own data definitions, its own routines and procedures, its expertise and experience, and its own frames of reference (Bekkers et al., 2007; Homburg, 1999 and 2000; Bellamy et al., 1997). According to Siau and Long (2005) to achieve this aim, governments should go through process re-engineering.

### 4.3.2 Organizational Challenges

Once systems are integrated and automated, most transactions are automated, and government employees are now becoming more an overseer of the process than task-oriented worker. Clear responsibilities should be allocated and procedures should be in place about what to do if a system fails, who is responsible for solving the problem, and how the problem will be solved (Janssen et al. 2006). Effective implementation requires agencies to collaborate across organizational boundaries in order to present information and service delivery in a way that it is seamless rather than fragmented across departments. (Tolbert et al., 2008; Fountain 2001; Peters 2001; Rudman et al., 2003; Sawyer et al., 2005). Overcoming organizational, geographic, and institutional boundaries is mainly a cultural problem that needs to be addressed when entering stage 3.

Tab. 4. Technological and Organizational challenges in the third stage of e-government

<b>Stage 3</b>	<b>Technological challenges</b>	<ul style="list-style-type: none"> <li>• <i>Integration</i> → L&amp;L, 2001</li> <li>• <i>Designing reliable processes</i> → Janssen et al., 2006</li> <li>• <i>Re-engineer</i> → Siau et al., 2005</li> <li>• <i>Typical functions</i> → Subscription, alerting, life-events, business-events, integrated forms for requesting products from multiple organizations (Janssen et al., 2008)</li> </ul>
	<b>Organizational challenges</b>	<ul style="list-style-type: none"> <li>• <i>Re-conceptualization of services</i> → L&amp;L, 2001</li> <li>• <i>Collaboration accross boundaries</i> → Tolbert et al. 2008; Peters 2001</li> <li>• <i>Allocation of Responsibilities</i> → Janssen et al., 2006</li> <li>• <i>Culture for Sharing data and knowledge</i> → Rudman et al., 2003; Sawyer et al., 2005</li> </ul>

### 4.4 Stage 4

Horizontal integration refers to system integration across different functions horizontally and vertically (Layne at al., 2001). This is a different approach from the standard way of doing business where services traditionally are provided on the basis of departments in the hierarchical

organizational structure. In horizontal integration, systems are integrated across different functions, which breaks down the “silos” of information dissemination (Reddick, 2004a; Siau et al., 2005, Ho, 2002). The integrated phase of evolution is characterized by seamless interfaces that integrate all aspects of government processes, a “one stop shopping” for the citizen (Layne et al., 2001; Ho, 2002). Examples of applications include tailored Web sites, where government codified knowledge is pushed to citizens, and where they can pay local property taxes, renew state driver's licenses and apply for federal passports all in one place, with seamless interfaces back to the respective agencies involved in the transactions (Koh et al., 2005).

#### 4.4.1 Technological Challenges

Technically, integration of heterogeneous databases and resolving conflicting system requirements across different functions and agencies are major stumbling blocks for any government to reach this stage (Layne et al., 2001). Web service orchestration is one of the most promising new technologies to support interoperability using process-driven application integration (Zhao et al., 2005). Making agencies’ internal processes accessible using Web services and orchestrating the loosely coupled Web services creates integrated cross-agency processes. In this way, dependencies between agency processes can be coordinated just by their external interface descriptions, without having to know the details of how these internal processes are performed (Janssen et al, 2006).

#### 4.4.2 Organizational Challenges

Horizontal integration requires a change in the mindset of government agency directors. Changing cross-agency business processes involves addressing many challenges outside the control of the managers of a single agency. A cross-agency process concerns the chained execution of tasks by different organizations that are responsible for these tasks and are often part of different hierarchies. At this stage functional specialization may not be suitable as a governing structure. Public management is faced by radical changes as shared leadership is a more appropriate model for this stage



(Layne et al., 2001). Ho (2002) states that shifting to a new paradigm is not easy because of socioeconomic and organizational barriers like insufficient staff, lack of funding, and digital divide among racial groups. He advises that future advances in e-government have to go beyond simply advancing technology and into finding ways to address the social problems (Ho, 2002).

Tab. 5. Technological and Organizational challenges in the fourth stage of e-government

<b>Stage 4</b>	<b>Technological challenges</b>	<ul style="list-style-type: none"> <li>• Integration across functions → L&amp;L, 2001</li> <li>• Web orchestration → Zhao et al., 2005</li> <li>• Open processes to web services → Janssen et al, 2006</li> </ul>
	<b>Organizational challenges</b>	<ul style="list-style-type: none"> <li>• Multiple decision chains → Janssen et al, 2006</li> <li>• Shared leadership → L&amp;L , 2001</li> <li>• Organizational barriers → Ho, 2002</li> <li>• Codification and integration of knowledge → Schooley et al., 2007</li> <li>• Clarify responsibility → Schooley et al., 2007</li> </ul>

## 5 Discussion and Conclusions

In this paper we have analyzed the technological and organizational challenges that public organizations face when moving from one stage to another in their e-government maturity. This analysis has allowed us to identify some critical issues that these organizations have to face in their evolution. Since 2000 these maturity models are used as roadmaps in governments (European Union, USA, Australia) to guide evolution in public administration and also as evaluation tool to gauge evolution level.

The main take away from this literature study is that all models take for granted a direct relationship between service complexity, technology as support of these services, and internal skills to carry out successfully the provision of the services. In other words the assumption is that a learning curve governs the provision of electronic services. The logic of this assumption is quite clear and almost hard coded in human: we crawl before we walk, we walk before we run, we run before we bike, we bike before we

drive. In the human metaphor there are the same elements that we find in e-government maturity: increase performance – in this case speed – requires increased skills and more complex technology.

For how logic this assumption sounds we cannot help thinking that when all research points back at a model from 2001 when e-government was more a dream than reality than we may see more a self fulfilling prophecy than an adequate version of reality. In carrying out some preliminary studies we found that some assumptions do not seem to hold.

First, agencies moving into e-government now do not live anymore the problem of getting acquainted with technology. Internet services such as e-commerce and e-banking are now the normality and are almost expected. Both citizens and public officials are now regular users of internet services and therefore have enough skills to use and manage – with the appropriate training – complex services. The learning curve implied in the maturity models is therefore less relevant now than seven years ago.

Second, most public agencies live nowadays the same credit crunch that companies live and therefore their services cannot be at one stage but widespread. Services need to be goal oriented. If a municipality has a certain problem they will try to solve that problem even if that would include integrating anagraphic services (internal) with educational services (external). This is for example the case of cities that offer free transportation to school to kids of families with a revenue below a certain threshold.

Third, services that are particularly successful, and undoubtedly information is one of them, can also grow at different levels. Even though stage 1 services can be supported by mature and simple technologies this does not imply that they cannot be supported more efficiently with advanced technologies. There are nowadays technologies that enable interactive information searches that are very sophisticated (see example in fig. 2 from the portal of the city of Århus, Denmark) or that allow full configuration of the layout of the page depending on the profile of the visitor. The main technological challenge at stage 1 is in matching the level of sophistication and experience of the public service with technology with the technology itself. Informational services need to be supported by basic technologies only if the public office is moving its first steps into this area. The public service has also to consider the level of sophistication of the user/citizen that may reject too basic services (e.g. a single, very long page

with all the information about a town as it is sometimes found for rural towns in e.g. Italy, Spain, or Portugal).

Forth, Emma (fig. 2) also shows that maturity – and we can here begin to think is maturity means something at all – is not a linear process. Services are created and begin to live a life on their own. There are populated, they are improved, they die, and they change while remaining substantially the same service. Information can become more interactive, transaction can become faster or more secured, identification can be local, national, or continental. The sophistication changes while the services remain the same and the maturity models could not account for this behaviour.



Fig. 2. Interactive search at Århus Website (<http://www.aarhuskommune.dk/portal/forside> visited on 21-11-2008)

Fifth, technology providers are nowadays following the example of ERP developers and are providing very sophisticated packages to public

services. These packages are customizable to different situations and are easy to use both internally and by the citizens. Technology provides, by working both on looks and on ease of use have created appealing packages for the agency ready to jump into e-government and even jump some stages.

These five points are indicators that there is the willingness to move forward fast, the need to do so, and the possibility to do it. There is ground to abandon the learning curve as sole model to explain public maturity with technology and consider it rather as a specification of a wider model of technology adoption and innovation in the public sector. Our future research will focus exactly on this point: abandon pre-conceptions and study evolution of e-government as it really happens and possibly find other specification of the model of adoption and innovation that can complement the learning curve one ... and can justify the existence of an informational service like Emma (fig. 2). Providing answers to those questions is of fundamental importance to aid the municipalities not only on what to do but also on how to do it which is a key leverage point for the creation of the European knowledge economy.

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