E-government maturity models: Extension of the Layne and Lee model

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Available online 7 February 2006

Abstract

The article proposes a reorientation of the e-government maturity models by focusing IT applications to improve the core activities and bring end-users as the key stakeholders for future e-government investments. The proposed Public Sector Process Rebuilding (PPR) maturity model is an extension of the Layne and Lee model.

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1. Introduction

The e-government wave has caught the attention of not only the software and consultant industry, but also in the policy institutions, the public administration, and by an increasing number of researchers, at conferences, and workshops. Although there indeed was solid research on IT in government during the 1970s, 1980s, and 1990s and limited new fundamental new research perspectives has been introduced with the e-government wave,¹,² there is a momentum and mass of researchers that could form the basis for breaking new research grounds in studying the new face of government.³

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As part of the enthusiasm on IT in government, best practices and maturity models are being developed and applied to monitor whether governments are on the right track. The perhaps most quoted e-government maturity model published in Government Information Quarterly argues that progress on e-government data integration is a matter of technological and organizational complexity. The maturity model developed by Layne and Lee has been quoted frequently by various research communities and is one of few examples of studies within e-government where one can identify a linkage and additive value.

With the new generations of IT, we suggest that strategic use of IT to be directed to cover more dimensions than simply integration issues and supportive functions of formal government primarily provided by technology. Our key argument pursued in this article is that the maturity models for e-government stages need to capture the future use of IT applications with the external users such as citizens, businesses, and other governmental agencies when performing the core activities in government. The proposed maturity model that could help further progress of the e-government is labeled the Public Sector Process Rebuilding (PPR) model.

In the article, we raise an alert signal for use of the Layne and Lee model arguing that it reinforces the technology bias pushed by government and international organizations when promoting e-government. The technology quest for data integration that enable government to harvest economics-of-scale benefits, improving document repository facilities, and reduction transaction costs indeed are reasonable motives for government to pursue when investing in IT. After more than thirty years of use of IT in the public sector, these benefits are, however, self-evident and government should move beyond these benefits focusing more on streamlining core processes and reaching customers in a more efficient manner.

The proposition in this article is that we should avoid grounding our maturity models in operational and technical interfacing only. Instead strategic ambitions on government use of IT should be in focus. As reasonable the traditional motives for IT adoption are, the Layne and Lee model is replicating the dominating rationalities for adoption of technologies followed by the government during the 1970s, 1980s, and 1990s. Motives on increased information quality, efficiency, and effectiveness and intra/intergovernmental interaction dominate not only the Layne and Lee model. A literature review on e-government research conducted by the authors of this article clearly demonstrated that issues as values, interaction, and orientation are not in focus for e-government research. Rather e-government literature comprises predominately themes as information quality, efficiency, and effectiveness.

This article should not be read as a critique of the Layne and Lee model. Rather, the article is proposing to reorient e-government strategic thinking by a thoroughly examination of what e-government is all about. We offer in Section 2 of this article our input to that discussion. In Section 3 of the article, we examine several maturity models in use in both academia and in practice. In Section 4 of the article, we put forward the proposed PPR model and provide illustrative cases of the four maturity levels. One of the downsides of maturity models is that they often end up labeling maturity in opposition to immaturity, as a discrete variable. Introducing the PPR model, we offer the view that rather than labeling a government unit as mature or immature, focusing on a set of activities through the lenses of the customer is more constructive view in strategic thinking. We conclude the article in Section 5 by discussing
strategic implications of the proposed model and propose roads to follow for furthering the research on stage models.

2. The notion of E-government

The position taken in this article is that e-government applications and strategies are cultivating a better-safe-than-sorry strategy escorted by horizontal and vertical integration of back-office and front-end systems at the expense of exploring new areas and dimensions of interaction with the end-users. As such, e-government might be more a symbol of crisis of previous generations IT quests in government than an indicator of change in government.

In the implementation of e-government applications, governments are seeking efficiency, effectiveness, and data quality improvement gains. Subsequently, the governmental administrative functions and activities along with general front-end services dominate the application arsenal. Less frequent are IT applications directed towards policy input and customer involvement. In essence, while transactions might become faster and information quality improve as national e-government strategies are implemented, there is room for exploring the government potential to bring the activities and the linkage between the individual case worker in government and the company, citizen, or politician in focus for future research and strategies on e-government.

Various authors have pointed out that technology does not have an impact per se, it is all a matter of choice, power, and situated change—IT is not evolving by itself; it is all about decisions on how to adopt IT at the societal, organizational, and individual level. If so, e-government is a profound example of this failing to live up to their expectations by ignoring the power of organizational and social institutions.13,14

Although there is high reliance on the Internet dimension in the technology domain of e-government, older technologies such as electronic document interchange (EDI) and newer mobile technologies are vital technologies at the activity level of e-government. The technology-fix of e-government is a critical component in implementing visions of abandoning the prevalent division between inside and outside the governmental organization, pushing for data and application mobility across vendors, and transferring data ownership to the customers. Despite we acknowledge and emphasize the role of technology, e-government strategies have endless faith in technology as a driver for e-government but few attempts have been made to reorganize the other elements in making information systems work.

The “e” reflects what the late Rob Kling labeled utopian optimism and technological centric beliefs stipulating that a digital front-end in itself is a mechanism of change. We advocate that a more reflective and critical use of IT is desired. Rather than focus on the front-end, we argue that the core processes and the activities involved are a more prosperous road to follow.

This observation is supported by the literature findings on the terms e-government, e-governance, online government, digital government, one-stop government, and electronic government. Of these six concepts, e-government is the most frequently cited term.
occurrence is interpreted as indicating a high reliance on formal government rather than on the activities performed by government. In pursuing the e-government road, various objectives are pursued (transparency, accessibility, accountability) spanning a variety of government operations (governmental administration, front services, policy input, and involvement of users/citizens).

3. Maturity models in E-government

The terms “maturity” and “immaturity” are often used to characterize the state of a given level in a continuous process. The terms are used relative to their objects (e.g., “e-government is still in an immature state”). This use of the term “immature” in relation to e-government creates an ontological vacuum because both the term and its object are somewhat fuzzy.

The concept of e-government represents a rich pool of organizational and technological issues. Adding the notion of maturity or immaturity does not strengthen the ontology of the concept. Some qualitative and/or quantitative measures to determine what characterizes different degrees of maturity are necessary.

There are a number of academic disciplines that use the term maturity and develop maturity models as classification schemes. In the field of software process improvement, the Capability Maturity Model, a measure of maturity, determines how structured the software development process is. Within the field of business economics, examples of explicit usage of the term maturity are found in the Product Life Cycle concept.

In the information systems (IS) field, the term maturity is also familiar, for instance in the context of the “Stages of Growth model”. The Stages of Growth model illustrates the organizational stage in a development process where the organizational usage of IT is measured. Whereas Galliers and Sutherland decomposed maturity into six stages with each stage characterizing the presence of particular attributes of the organization, the strength of the Stages of Growth model is in its focus on IT and organization. This overall typology of technology and organization is used as a point of departure in the further development of an e-maturity model where the focus is on the organizational and technological capability to engage in e-government.

As a caveat with respect to the often used classification schemes based on maturity models, it should be acknowledged that not all researchers agree on the suitability of “evolutionistic” development models as a means for measuring IT capabilities in organizations.

Within the IS community, the debate on stage models is classical, suggesting that as appealing as stage models might be, there is often a normative value in the stage model with an evolution over time, which indirectly states that phase IV is better than phases I, II, and III. In practice, however, the individual phases occur simultaneously and are part of different elements of e-government. Also, the triggers for moving to one stage rather than another stage are more rewarding to focus on rather than observing whether or not government is at stage I or IV.

Acknowledging this critique of maturity models, we stress that the four levels of our proposed model do not appear as distinct stages. The four levels rather represent discrete points in a continuous development process in the organization. The four levels should
therefore be used as indicators for positioning the organization in the e-government landscape and not be regarded as absolute measures.

Although we acknowledge the potential shortcomings in stage models’ capacity to capture the drivers and evolution of e-government, stage models can be one element in formulating a strategic flag pole and milestone framework for emergent areas as e-government. Within the strategic context, various consultant companies and consultants,\(^{22}\) national and international policy-institutions,\(^{8,23}\) and researchers\(^{4,24,25}\) have formulated diffusion stage models and have begun gathering empirical data to investigate the categorize local and national governments in the different levels. For example, Moon relies on the maturity model proposed by PricewaterhouseCoopers.\(^{22,24}\)

The World Bank provides an example of this analogue to the e-commerce stage models by arguing that “E-Commerce has evolved already through four stages: 1) publishing, 2) interactivity, 3) completing transactions, and 4) delivery. To date, most e-government activity has centered on publishing. A study by Anderson Consulting finds vast differences among countries in the maturity of their e-government effort. Perhaps the key finding, however, is that even the most mature countries have tapped less than 20% of the potential.”\(^{26}\)

Complementary to the World Bank model, the UN has identified five stages that essentially capture the same issues (see Fig. 1): The emerging stage is where there is an official government online presence established; stage two (enhanced) is where the government sites increase and information becomes more dynamic. Level three is the interactive stage where users can download forms, e-mail officials, and interact through the Web. Level four is the transactional stage where users can actually pay for services and other transactions online. Stage five is the seamless level where there is full integration of e-services across administrative boundaries.

![Fig. 1. The World Bank stage model of e-government.\(^{26}\)](image-url)
A more comprehensive stage model has emerged from a study of various government Web sites and related e-government initiative. The proposed model identifies a “…multi-perspective transformation within government structures and functions as they make transitions to e-government through each stage.”

The issue of integration is profound in the Layne and Lee model. The Layne and Lee model reinforces intragovernmental data integration with a front-end built on top. This could enable integration and will require the solving of various technological and organizational challenges. The World Bank and Layne and Lee to a large extent have done little more than replicated the stage models from the e-commerce area focusing more on technological capabilities than on case handling and effectiveness in the public administration. As was evident with the forecasts and typologies for e-commerce progress, most of these failed and did not capture the picture right. The danger of ending in the same situation in the e-government field is high if progressing along the Layne and Lee model (see Fig. 2).

4. The PPR Maturity Model

The major difference between the Layne and Lee model and the Public Sector Process Rebuilding (PPR) model is the activity and customer centric approach rather than the technological capability. The two key dimensions are displayed along the horizontal and

![Fig. 2. The Layne and Lee model: integration and technological and organizational complexity.](image-url)
vertical dimensions, respectively, in Fig. 3. Applications developed along these two dimensions can be rare or widespread in the extended organizational room of governmental activities. Rather than being discrete variables, the variables should be used as a continuum.

The cultivation phase (I) shelters horizontal and vertical integration within government, limited use of front-end systems for customer services, and adoption and use of Intranet within government. There can be elements of self-service but most often in the form of PDF files that can be downloaded, completed, and then returned either as an attachment to e-mail or by mailing the completed form to government. The organizations in this group are not likely to have digital services in focus and will rarely have work processed and displayed through the net. Instead, the organization is unclear whether to define the objective with the use of the Internet to increase the user frequency, the services provided, and/or the quality and speed of services.

From the user point of view, the Internet interface to the public institution in this phase can be experienced as yet another means of enforcing “gate keeping” and filtering the users. By gate keeping, the employees are protecting against stress and they are able to control the information flow. The downside is that the public institution in this phase will be experienced as inaccessible, have long case processing time, and no accessibility for accessing the processing of requests.

Clearly many organizations within this group are keen users of IT and will often prioritize internal data integration and await the completion of data integration before proceeding to digital interface to the users.

This is the stage where most governments are now, and worse it is often considered a strategic goal for most governments. Having the characteristics of this phase as a strategic goal can be counter productive to the activity and customer focus.

Fig. 3. The PPR maturity model: activity and customer centric stages.
Phase II is the extension stage with extensive use of intranet and adoption of personalized Web user interface for customer processes. There is a sharp distinction between “our data” and the services provided through “them”.

Ownership and data infrastructure are essential as in phase I, but the Web user interface is targeted towards the end-users rather than other public authorities or the agencies themselves. The ambition of having a user interface for the end-users shines through the actual Web site. While this is a key difference between phases I and II, this ambition also presents a key failure risk and precipitates costly user interfaces, no integration with other systems, expensive maintenance, and fading out of old software and data format.

At this stage there are still many manual routines, and while the user might be likely to find many forms and information, the agency is equally interested in re-directing the users to information at other agencies.

Whereas it is a frequent feature at many Web sites to provide link icons to other information, we view this feature negatively: The more links to other places, the more negative we would rate the agency because this indicates that the users did not get their requests for information rewarded at this particular agency.

Phase III is the stage where the organization matures and abandons the use of the intranet, have transparent processes, and offers personalized Web interface for processing of customer requests. The Internet and intranet have merged and the key concern is to use IT to lower the marginal costs for processing the customer requests for services. Rather than linking to other institutions, the homepage is feeding information from other institutions to the users online. Further, the Web site is organized to solve problems and requests rather than presenting formal organizational structures and general information. Self-service is a key priority in this phase and the exceptions where this cannot be completed online are clearly stated with instructions on how to proceed in analog mode.

Phase IV is the revolutionary phase characterized by data mobility across organizations, application mobility across vendors, and ownership to data transferred to customers. In this phase, the employees’ actions can be traced through the Internet and there is information available online about progress in, for example, case handling. This is possible through intra- and extraorganizational mobility of data and services. Also, economics of scale is sought after actively. The Internet is not seen exclusively as a means to create increased mobility within the government. Rather, the ambition is to transfer data ownership and the orientation of data base infrastructure to the end-users.

There indeed is a long push to reach phase IV. The blooming literature on e-government has provided the fuel for the hypothesis that governments are still predominately in phase I, that is, they are aiming for data and system integration but have only limited front-end services, and essentially still have an intra- and intergovernmental view of the development and implementation of IT.

Accordingly, a personalized Web interface for customer processes, data mobility across organizations, application mobility across vendors, and transfer of data ownership to the customers is still not implemented and constituted in light of the PPR approach key challenges to be met.
For example, the lack of mobility on data and application level lock-in government and their customers to path dependency and decreases in competition for IT-enabled services. The in-house and lock-in path has been a convenient road to follow for government, its consultants, and IT suppliers because this has in reality created a myriad of e-government solutions that are just as incomparable, in-transparent, and inaccessible for the customers as the previous information and communication channels were. The only difference could be that they are “faster and smarter” as formulated by the former UK e-envoy.

5. Findings

We found the state agencies to be less advanced along the two dimensions analyzed in the study: the degree of activity centric Web pages and processing of the end-users information and service requests. Based on an assessment of 110 state agencies and boards, we identified four illustrative cases—one from each maturity level.

From the first category, the cultivation level, one of the interesting cases emerging from the study is an agency where profound investments in internal case handling was supplemented with phone assisted case handling and physical meetings. Although part of the reason for the manual routines is law requirement of physical identification of the persons, the case is illustrative of how all bits and parts of case handling are left to traditional communication patterns at this stage of the maturity model.

The second category, the extension stage, is illustrated by a state agency handling complaints from the health sector. There are numerous forms that can be downloaded in digital format but the sequence of activities has not changed. Yet, the target for the homepage appears to be the end-users whereas institutional interests have been downplayed substantially.

Individual case workers at the agency and their individual contribution to solving the problems and information requests put forward by the users of the Web site is not exposed through the Internet. Instead, the users are overall left to routines that have not changed and it is unclear how the core activities of the agency are still by and large shielded from the users.

The third category, the matured level, is illustrated by a case from an agency that not only had various self-service solutions and the end-user in focus but also explained the technologies and the application of, for example, digital signature. In contrast to the other analyzed agencies, they put effort and commitment in aiming for online services.

Most of the services from the agencies are not breaking new ground. They are old routines simply digitalized. Examples of PDF forms en masse are profound examples of what makes sense according to the Layne and Lee model but aid little to the strategic development of the public sector. With more than 80 percent of the workers in agencies working without being impacted by e-government, it is worth reflecting on whether the field is in need of new strategic models.

The revolutionary level, the fourth category, is the least populated category. A premier example from this category is the National Agency for Labor Injuries. Through the
1990s and beyond, they have aimed for a high digitalization and reduction of overhead costs. Benefiting now from these early investments, users can access their cases, follow the progress, and see who and when professionals and case workers have accessed their case.

Another example in the category revolution where there is mobility of data and access for users is the National Tax Authority. At their first launch of a Web site, The National Tax Authority experienced a soaring use of their Web site but an almost unchanged number of phone calls asking for information. That puzzled the vice director for the Authority. Despite the callers being online, they had not managed to find the information that the employees should easily have been able to find using the Internet platform.

By monitoring the key words that the end-users and the employees employed, the agency reorganized the user interface and the data infrastructure. For example, the employees might call a form a “car assessment form” and the users called it “car registration form”. As a result of redesigning the Web site and removing the intranet for searching in the catalogues, they reduced the phone calls by 30 percent.

Similar results were demonstrated by an Australian survey where they tested four stages they labeled presence, interaction, transaction, and transformation of government agencies in general. About half of the responders were in the first group regardless of level of agency (state, county or municipality). Only a very few managed to qualify to the fourth level of the model. The Australian study also addressed the level of sophistication of government portals, classifying the content of portals in four levels aggregation, personalization, integration, and unification. Sixty percent of their responders were at the lowest stage of evolution (aggregation of content) and only six percent were at the most advanced stage (assessing data and content of all government departments).

In another Australian study of the adoption of e-government, a similar distribution was observed. In Clark’s model, stage 1 represented the agency’s ability to publish information about itself and stage 2 allowed citizens to access data and interact with the agency through the Internet. In the third stage, citizens were permitted to enter secure information and make transactions with the agency. The fourth and final stages provided the citizen with access to integrated services between different government agencies, regardless of point of entry. The two mentioned studies confirm that there is still a long way to go before we can talk about a one-stop government.

In our view, the two studies share at least three features which are different from the PPR approach to maturity. First, the focus is on what is feasible from a technological perspective. The studies are in that sense along the lines of the Layne and Lee model.

Second, the stages in the models tested reflect a view of government agencies where things should not be changed too much. The underlying assumption being that e-government is acceptable in those cases where it is possible to digitize without changing routines.

The third element which is not clear from reading the studies and therefore interpreted as not being important in the studies is the eagerness to categorize activities in different stages without considering their relative importance for reaping the benefits of the investments in technology and organizational change. The studies are more occupied with classifying levels of interaction instead of considering the possible benefits of interaction. The PPR model
focuses on core activities being transferred to a media where citizens can service themselves thereby redistributing resources in the government agencies.

6. Conclusions

The proposed maturity model is changing the focus of e-government to the front-end of government and away from a technical integration issue, as is suggested in the Layne and Lee Model. Also, contrasting the Layne and Lee model, the proposed PPR model emphasizes the digitalization of the core activities not from the perspective of what is technologically feasible but from what is beneficial for the end-users regardless of the possible internal changes caused by the digitalization.

There are cases where the PPR model is less appealing. In the governmental agencies and the part of their work where direct user contact is explicitly stated as not part of their mission, such as the intelligence units and the police (homicide investigation), it is tempting to argue that the PPR argument that activities and services should be in focus for the Internet applications is likely to do more harm than good. Although we acknowledge that (large) parts of the police work do not qualify for full transparency through the Internet, the degree of customer orientations in this sector varies greatly among countries. In the United States and Sweden, for example, the DMV allows citizens to apply for renewal of their car registration through the Internet. In other countries, as Denmark, this is still a manual process where the car owner has to register in person.

The use of the PPR model to capture the maturity level of state agencies in Denmark, considered one of the most developed e-government countries, exposes an embryonic use of the Internet rather than using the Web to make the case workers visible. The low scores are surprising, given the overall diffusion of the Internet to the households and companies in the Danish case.

Being among the world’s top five in terms of modem and broadband connection to the Internet for companies, private households, and the public sector, the government sector, surprisingly, has not managed to exploit the potential for opening up the governmental black box.

One implication of the lack of progress along the two key dimensions in the PPR model is to call for more research into the driving forces for possible progression along the model’s four phases. Should agencies that commence at one stage remains at this stage? Is there a pattern is the characteristics among the agencies that progress or fade from one stage to another? Also, it is not clear “how much” of an agency’s homepage should be activity and customer centric to constitute a critical mass to progress to the next stage. These unresolved issues are to some extent a result of the inherent problems with stage models.

Also, using other data collection methods could possible lead to other conclusions. Qualitative case studies and longitudinal studies along with log files of supply and demand are some of the roads we will take in the coming years to seek to answer the unanswered questions that have surfaced from the use of the PPR maturity model in the empirical study reported in this paper.
Notes and References


