Measuring e-Government Maturity: A meta-synthesis approach

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Abstract

Many governments in the world have created e-government initiatives including developed and developing countries. In order to better understand e-government evolution, different maturity models have been developed by many authors. In this paper the most cited e-government maturity models are analyzed using the meta-synthesis approach. As a result, five stages of e-government maturity are identified. The comparative results show the supported stages by each e-government initiative as important elements in the decision making process. This paper is attempting to show that although there are many models for measuring e-government maturity, they all converge on one common model. The contribution of this paper is in simplifying work for researchers when choosing the right maturity model.

Key words: *e-government · digital government · e-government maturity model, meta-synthesis*

1. Introduction

There are many definitions for E-government and many authors and institutions define e-government in their own way. One of the most cited definitions in literature is from the World Bank: "E-Government refers to the use by government agencies of information technologies that have the ability to transform relations with citizens, businesses, and other arms of

government" ("World Bank: e-Government," n.d.). Also, according to the World Bank these technologies can serve a variety of different processes: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions. Another frequently cited definition of e-government is from the United Nations which defines e-government as: "The use of Information and Communication Technologies and its application by the government for the provision of information and public services to the people. According to aforementioned definitions, the aim of e-government therefore is to provide efficient government management of information to the citizen; better service delivery to citizens; and empowerment of the people through access to information and participation in public policy decision-making" ("United Nations E-Government Development Database," n.d.). Another important organization that has its own definition is the OECD. According to the OECD, e-government is "The use of information and communication technologies, and particularly the Internet, as a tool to achieve better government" (Organisation for Economic Co-operation and Development, 2003). The European Commission on the other hand defines e-Government as "the use of information and communication technologies in public administrations combined with organizational change and new skills in order to improve public services and democratic processes and strengthen support to public policies" (Alabau Muñoz, 2004).

From the definitions that we mentioned above we can draw several common points. According to these definitions there are three key points:

- government,
- use of Information and Communication Technologies and,
- provision of services.

Based on this, the definition of e-Government would be: e-Government is the use of Information and Communication Technologies in providing improved government services.

Many governments in the world have created e-government initiatives including developed and developing countries. According to a report from the United Nations about e-government, most of the countries in the world have begun e-government initiatives and have invested in ICT applications to provide better services, achieve operational efficiency and streamline their business processes in order to support sustainable development (United Nations & Department of Economic and Social Affairs, 2012).

Researchers on the other hand have developed e-government maturity models in order to understand, explain and forecast e-government development. This research paper compares these e-Government maturity models using meta-synthesis approach and identifies common elements in the chosen e-government maturity models.

The importance of this research paper lies in simplifying the work for researchers who need to choose a maturity model for their research.

This paper is organized as follows: Section 1 describes e-government services followed by analysis of e-government maturity models in section 2. In Section 3, comparative analysis of e-Government maturity models using meta-synthesis approach is performed. Section 4 concludes this paper by summarizing the key points.

2. e-government Services

Modern e-Governments not only have an online presence, but also they provide many services to other government institutions, citizens and businesses using the Internet. These three types of services are classified as: government-to-government (G2G), government-to-business (G2B), and government-to-citizens (G2C) and of course the reverse of the aforementioned (Palvia & Sharma, 2007; "United Nations E-Government Development Database," n.d.).
G2C are those activities in which the government provides one-stop, on-line access to information and services to citizens (Palvia & Sharma, 2007). G2C services allow citizens to retrieve government information and complete government transactions, such as the download of forms, payment of taxes, driving license renewal, etc., and all of this online (Carter & Belanger, 2004; Löfstedt, 2008).

G2B are those activities that allow businesses to retrieve timely government information and complete transactions with government agencies online (Carter & Belanger, 2004; Löfstedt, 2008). Examples of G2B services are: electronic filing of taxes, electronic submission of financial reports, payment of employee insurance, electronic procurement, etc.

G2G are those activities that allow the government agencies to interact with each other in terms of sharing information and performing online transactions (Carter & Belanger, 2004; Löfstedt, 2008).

It is necessary to notice that e-government is very similar in categorization to e-commerce. However, there are differences as well. According to Jorgensen

and Cable, there are three major differences (Jorgensen & Cable, 2002). In e-Commerce, businesses are allowed to target how they serve. In e-Government, the government is responsible for providing access to information and services to the whole eligible population without any discrimination, including individuals with disabilities (Carter & Belanger, 2004). The digital divide makes this task of providing universally accessible online government services challenging. The second difference is that the organizational structures of businesses are different from the organizational structures of government agencies, where the decision-making is more centralized in government agencies than in businesses. This dispersion of authority hinders the development and implementation of new e-government services. The third difference between e-Commerce and e-Government identified by Jorgensen and Cable is accountability (Carter & Belanger, 2004). "In a democratic government, public sector agencies are constrained by the requirement to allocate resources and provide services that are in the best interest of the public" (Carter & Belanger, 2004).

3. e-Government Maturity Models

There are many models for measuring the maturity of e-government and there is good amount of literature treating e-government maturity models such as (Andersen & Henriksen, 2006; Carter & Belanger, 2004; Layne & Lee, 2001; J. Lee, 2010; Moon, 2002; Valdés et al., 2011). Those models come from practitioners, institutions, as well as researchers in the field. These models were chosen based on the number of citations on Google Scholar searching for keywords (e-government OR digital government OR electronic government OR egov) AND (maturity OR development OR stages OR stage OR staged) AND (model OR models). Once the most cited papers were identified, then the Pearl Harvesting Method (R. Sandieson, 2006; R. W. Sandieson, Kirkpatrick, Sandieson, & Zimmerman, 2010) was used to further expand the number of papers in order to identify the relevant literature in this filed. In order to understand better the similarities and differences of the considered models, they will be reviewed together with their capabilities and shortcomings.

Next, the e-government maturity models will be introduced based on the timeline they were published.

3.1. Layne and Lee's Four Stages Model.

Layne and Lee's Four Stages Model (Layne & Lee, 2001) model looks at e-government maturity from two dimensions: Technological and Organizational Complexity, and Integration. The complexity dimension ranges from simple

to complex, whereas integration ranges from sparse integration to seamless integration. Looking at the e-government maturity from this perspective we can come up with four stages of e-government development: (1) Catalogue Stage, (2) Transaction Stage (3) Vertical Integration, and (4) Horizontal Integration.

During the first stage, governments are trying to have an online presence with building web sites and presenting information to citizens through these websites. At the early phases of this stage the information is very limited.

During the second stage, since governments have already built an online presence, they start to go one level up by allowing citizens to transact with the government electronically.

During the third stage, Layne and Lee state that governments will try to integrate their services vertically. According to them, it is much easier to integrate similar functions in different levels of government rather than trying to integrate different functions at the same level of the government. Typical at this stage is the Government to Government (G2G) interaction, which means information systems at different levels can communicate with each other, reducing data redundancy, improving the consistency of outcomes, and increasing opportunities for cost-sharing partnership, and resulting with cost savings (Ebrahim & Irani, 2005).

At the fourth stage or final stage, government's horizontal integration of information systems will take place, which is the most complex stage of e-government integration and from the integration point of view the authors call it "seamless" integration. With horizontal integration, governments achieve similar vision to those of Enterprise Resource Planning systems in business world (S. M. Lee, Tan, & Trimi, 2005).

3.2. Public Sector Process Rebuilding (PPR) Model

An extension of the Four Stages Model was proposed by Andersen and Henriksen in 2006. Andersen and Henriksen take an activity and customer centric approach rather than the technological capability approach.
According to Andersen and Henriksen, e-government is developed in four phases: (1) Cultivation, (2) Extension, (3) Maturity, and (4) Revolution. The development phases are viewed from two dimensions: customer centric, and activity centric applications. The values of the two dimensions range from rare to widespread and are continuous rather than discrete.

Phase I is characterized by horizontal and vertical integration of the e-government, front-end systems for customer services, and adoption and use of

intranet within government. Phase II is characterized by the extensive use of intranet and adoption of personalized web user interfaces for customer processes. These user interfaces are presented through web sites. However, the downside of this phase is the cost of developing and maintaining separate websites as a result of non-integration with other government agencies. There are still manual procedures at this stage, and while there is wealth of information for the end-users there is still a tendency of redirecting the users to other agencies. Phase III is characterized by abandonment of intranet and integration of intranet with Internet. Web sites at this stage offer processing of requests for services from customers and the priority is to lower the marginal costs for processing these requests. Phase IV model is characterized by "data mobility across organizations, application mobility across vendors, and data ownership transferred to customers" (Andersen & Henriksen, 2006). At this phase transparency is very evident by the ability to trace employee actions as well as progress of requests through the Internet. This stage provides increased mobility and also transfer of data ownership to end-customers.

3.3. *The World Bank Stage Model*

At the first stage, according to the World Bank model, governments are publishing information online through the websites, which is one way communication. At this stage customers can have access to rules, regulations, documents and forms. Comparing this to web evolution, this stage of e-government resembles web 1.0, where web sites are "read-only" rather than "read/write". At the second stage, according to the World Bank model, governments engage citizens with the possibility of interaction at all levels of government. Engagement of citizens at this stage contributes to building public trust in government. The third stage of e-government, according to this model, is possibility to transact, i.e. ability to make online transactions. At this level, users of government services can use government services and can perform tasks, through e-government interfaces, usually web sites. This model resembles the e-commerce development stages and it seems that the World Bank, with this model, views e-government as G2C type of e-commerce. This is supported by Andersen and Henriksen (Andersen & Henriksen, 2006).

3.4. *United Nations' Five Stages Model.*

Yet another institution creating a model for e-government maturity is the United Nations, with its Five Stages Model (Jayashree & Marthandan, 2010; Ronaghan, 2002). This model foresees five stages of e-government evolution: (1) Emerging presence, (2) Enhanced presence, (3) Interactive presence, (4) Transactional presence, and (5) Seamless or fully integrated presence.

According to the United Nations' Five Stages Model, the first stage is characterized by a few web pages that are static in nature where the information published is very limited. The second stage of e-government is characterized by an enhanced presence where government agency websites are dynamic in nature and information is up to date. At this stage, users can find a wealth of information at specialized websites. The third stage is characterized by interactive portals where the information flow is in both directions, i.e. apart from users being able to read information, they are able to send feedback or to "read and write". At the fourth stage users can actually perform tasks and transactions such as renew documents, apply for personal documents, and update their personal records. At this stage citizens indeed get serviced by the government online. At the highest stage of e-government, governments create a so called "one-stop shop" where there is one universal website where users can see and perform all the services available from the government. UN's Five Stages Model looks at the e-government level from the interaction level between government and citizens, which is very similar to World Bank's Three Stage Model, and partially to Layne and Lee's Four Stages Model.

3.5.   Hiller and Belanger Electronic Government Framework

Hiller and Belanger also have created their model of e-Government stages (Hiller & Belanger, 2001). Their model consists of five stages: (1) Information, (2) Two-way communication, (3) Transaction, (4) Integration, and (5) Political participation. Hiller and Belanger Electronic Government Framework is an extension of previous models by adding the fifth stage which is Political Participation. This model, in essence, is similar to other aforementioned models in its approach, since it looks at e-government from a technological perspective. As the authors mention in their paper (Hiller & Belanger, 2001), their model is based on the previous four stage models adding a fifth stage "…to more completely represent the set." At the first stage governments make information dissemination through their websites. At the second stage governments allow two way communication, usually by email. At the third stage, governments allow complete online transactions. At the fourth stage, governments integrate their services, and this is usually accomplished through a single portal no matter which agencies offer them. However, as the authors state, the biggest obstacle in achieving this is the integration of their databases and information systems. This integration takes part at this stage which makes it possible for governments to make considerable savings from minimizing face-to-face interactions. The fifth stage of this model is political participation. The authors view this as the stage

where online voting, online registration or posting or comments online takes part. Although this might be considered as stage two or three in this model, the authors see this as a separate stage because of the sensitivity, such as privacy concerns, of these services.

3.6. Other e-Government Maturity Models.

There are also many other e-Government maturity models developed either by researchers or by institutions. Examples of these models are Moon's Model (Moon, 2002) which is an extension to the Hiller and Belanger's Model; Gartner's Model (Baum & Di Maio, 2000), etc. Other models including those discussed above are synthesized in Section 4.

4. Comparative Analysis of e-Government Maturity Models

In order to compare the aforementioned maturity models, a qualitative meta-synthesis approach is used. This method has been used by several authors to make a comparison of e-government maturity models. Maranny (Maranny, 2011) makes a comparison e-government stages models of 10 authors and he comes up with 8 unique different stages identified by these authors. Moreover, he identifies the stages of these authors and places them in one of his eight stages. His contribution is that he tries to synthesize all the maturity models into one model. Another contribution of Maranny is that he shows that all of the maturity models indeed have the same evolution in mind except that they are expressed with different names. One limitation of this study is that it uses a limited number of authors and models.

Shareef (2012) has a similar approach to Maranny except his approach is simpler and the maturity models that he takes into consideration are different. What Shareef does is he compares the models according to the number of stages instead of trying to identify how different stages of different authors compare to each other. This study, similar to Maranny's study, apart from taking a more simplistic approach, it uses a limited number of models and authors.

Lee (2010) makes another meta-synthesis analysis of twelve e-government maturity models. In his work, Lee comes up with two perspectives of e-government maturity: operation/technology perspective and citizen/service perspective. However, he merges them into one common model illustrated in Fig. 1. According to this model, there are five stages of e-government

development: (1) Presenting, (2) Assimilating, (3) Reforming, (4) Morphing, and (5) e-Governance. While this approach attempts to integrate all the relevant models from the period 2000-2010, it still neglects that different phases from different approaches would not necessarily correspond to each other. For example, according to Lee, the Integration phase from the Operation/Technology perspective corresponds to the Interaction phase from the Citizen/Service perspective and he assimilates them as an assimilating phase. However, providing interaction does not necessarily mean that the government is going through the phase of integration; this is much as a transaction phase does not necessarily mean streamlining.
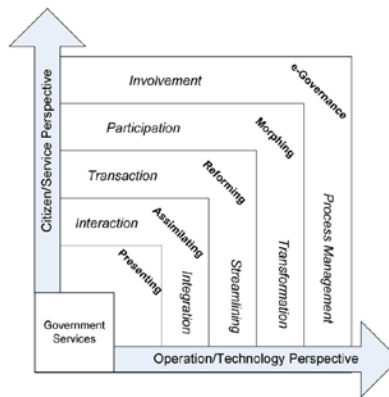

Fig. 1. *A common frame of reference for e-Government stage models. Source: Lee (2010) (J. Lee, 2010)*

Also, Jayashree and Marthandan, (2010) (Jayashree & Marthandan, 2010) use meta-synthesis to come up with common characteristics of analyzed maturity models. According to this study, most of the authors come up with the following stages: web presence, interaction, transaction, and integration, except for Siau and Long, (2005) (Siau & Long, 2005), who add e-democracy as the fifth stage (Jayashree & Marthandan, 2010). However, Jayashree does not take into consideration some other models such as Lee (J. Lee, 2010) and West (West, 2004).

Fath-Allah, on the other hand makes an extended comparison of the existing maturity models by analyzing 25 maturity models by different authors (Fath-Allah, Cheikhi, Al-Qutaish, & Idri, 2014). This study is one of the most detailed studies regarding e-government maturity models, which apart from listing stages of the 25 analyzed models, it also compares and contrasts these models in terms of the number of stages, years being published, as well as countries of these models. Indeed, this is a very comprehensive study of the e-government maturity models. However, as all other studies, this study has its

limitations. The first limitation of the study is that it makes general conclusions without matching stages of the models to each other, as Maranny does (Maranny, 2011). The second limitation of the study is that it does not include some important models such as Lee (J. Lee, 2010).

As an original contribution, this study makes an analysis using meta-synthesis method (Jensen & Allen, 1996; Walsh & Downe, 2005) and comes up with the similarities and differences between twenty five maturity models.

Model	Year	Information Dissemination	Interaction	Transaction	Integration	E-Participation / e-Democracy
Gartner group (Baum & Di Maio, 2000)	2000	☐	☐	☐	☐	
Deloitte and Touche (Fath-Allah et al., 2014)	2000	☐	☐		☐	☐
Layne and Lee (Layne & Lee, 2001)	2001	☐		☐	☐	
United Nations (Jayashree & Marthandan, 2010)	2001	☐		☐	☐	
Hiller and Belanger (Hiller & Belanger, 2001)	2001	☐	☐	☐	☐	☐
Howard (Howard, 2001)	2001	☐	☐	☐		
Wescott (Wescott, 2001)	2001	☐	☐		☐	☐
Moon (Moon, 2002)	2002	☐	☐	☐	☐	☐
Chandler and Emanuels (Chandler & Emanuels, 2002)	2002	☐	☐	☐	☐	
Windley (Windley, 2002)	2002	☐		☐	☐	☐
The UK National Audit (Dunleavy, Margetts, Bastow, Callaghan, & Yared, 2002)	2002	☐	☐	☐		☐
World Bank ("World Bank: e-Government," n.d.)	2003	☐	☐	☐		
Accenture (Rohleder & Jupp, 2003)	2003	☐	☐	☐	☐	☐
West (West, 2004)	2004	☐	☐		☐	☐
Reddick (Reddick, 2004)	2004	☐		☐		
Siau and Long (Siau & Long, 2005)	2005	☐	☐	☐	☐	☐
Andersen and Henriksen (Andersen & Henriksen, 2006)	2006	☐	☐	☐		
Cisco (Davies, 2008)	2007	☐		☐		☐
Almazan and Gil-Garcia (Almazan & Gil-García, 2008)	2008	☐	☐	☐	☐	☐
Shahkooh et al. (Shahkooh, Saghafi, & Abdollahi, 2008)	2008	☐	☐	☐	☐	
Kim and Grant (Kim & Grant, 2010)	2010	☐	☐	☐	☐	☐
Lee (J. Lee, 2010)	2010	☐	☐	☐	☐	☐
Chen et al. (Chen, Yan, & Mingins, 2011)	2011	☐		☐	☐	
Alhomod et al (Alhomod & Shafi, 2012)	2012	☐	☐	☐	☐	
Lee and Kwak (G. Lee & Kwak, 2012)	2012	☐	☐		☐	☐

Table 1. *: Meta-synthesis of e-Government Stages Models*

4.1. Similarities and differences between e-Government maturity models

Reviewing the models, it is very clear that most of the phases are more or less similar, with a few exceptions. First, all the models start from a stage which is an online presence. All the authors analyzed agree that the first initiative that governments take towards e-government is to create websites for the government and/or agencies. Most of the authors have one stage for information dissemination, except the United Nations model which has two stages devoted to information dissemination, and Almazan (Almazan & Gil-García, 2008) has two stages related for this stage. As the second stage, most of the authors take the interaction stage or two way communication between government and citizens. Indeed, only five out of twenty five models did not have two-way communication as a separate stage in e-government evolution. The third stage, according to most of the authors, is the transaction stage. This stage is characterized by citizens being able to perform online transactions with the government. This stage is very similar to e-commerce, where citizens do not need to have physical contact with government officials; rather, the transactions take place online. The fourth stage based on most of the authors' view is the integration stage. At this stage, governments integrate their backend databases and systems. This stage, based on its characteristics, resembles Enterprise Resource Planning (ERP) systems in the organizational context. Regarding the fifth and the sixth stage many authors view this stage as e-Participation, e-Democracy, or e-Governance.

However, the review of the 25 maturity models does show that all the authors agree that governments start their e-government initiatives with the dissemination of information through web sites in "read-only" state, or "Web 1.0". This continues with interaction or two way communication, or "Web 2.0". The third stage is an online transaction stage, or "e-commerce" stage. The fourth stage is backend integration "ERP stage". Authors do not agree on where e-government continues its evolution from the integration stage, but it involves some collaboration between the government and its citizens. This resembles Customer Relationship Management (CRM) systems or Supply Chain Management (SCM) systems in the corporate world, and it will be called here "e-Participation", as in most of the authors. The model is illustrated in Fig. 2.
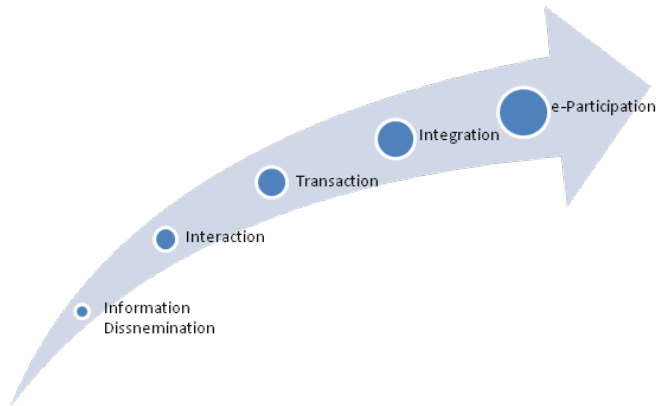
Fig. 2. *: Five stages of e-Government maturity*

It is also important to state that most of the e-government maturity models are created looking at the e-government from the perspective of services capability. However, it is important to state that a few authors look at the e-government maturity from different perspectives; examples of these are Lee (J. Lee, 2010), Valdez (Valdés et al., 2011), and Andersen [24]. These models are not very comparable to the aforementioned models since they look at the e-government maturity from a different perspective.

5. Conclusions

The purpose of this study was to make an analysis of the e-government maturity models by using a meta-synthesis approach. The results of the study show that no matter how much we try to aggregate different perspectives of e-government development such as operation/technology perspective and citizen/service perspective, still different perspectives of e-government have different development stages unique to that perspective. As Lee (J. Lee, 2010) states himself: one government does not have to go through all the stages. The same principle applies to merging different perspectives into a maturity model. It is difficult to come up with a model that will explain all the phases of e-government development from different perspectives.
Some of the contributions this study has identified are as follows:

- Common elements of different e-government definitions
- Common elements of e-government maturity models

- Most of the e-government maturity models have similar stages for the early e-government stages however they differ on what constitutes later stages of e-government development.
- Complexity of aggregating e-government maturity models that view e-governments from different perspective.
- Similarity of e-government maturity with corporate information systems/e-commerce maturity.

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