

Comparing and Contrasting e-Government Maturity Models: A Qualitative-Meta Synthesis

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Abstract. The e-government maturity model has dissimilar stages that range from basic to advance online interaction competence. E-government's portals use the stages to determine maturity. The aim of this paper is to evaluate e-government maturity models through a comprehensive review of related literature by identifying and mapping cohesions across the models. Apparently, the paper picks seventeen different e-government maturity models and makes contrasts and comparisons using a qualitative meta-synthesis method. Ideally, the paper draws two key results namely presence, communication and integration are main stages involved in all the maturity models and the level of interaction and complexity are found in all models

Keywords: Maturity model · e-Government · Qualitative meta-synthesis.

1. Introduction

The use of Internet and the World Wide Web to communicate, inform, interact, and deliver government information and services to the citizens by the private sector and government agencies is referred to as e-government [1]. Apparently, the model applied when analyzing the maturity of an e-government portal has many different stages. The stages range from basic information provision to advance transaction capabilities. They are used to determine the maturity of the e-government portal. By applying a maturity model to rank e-government portals, governments and practitioners understand improvements required to make to the e-government portals [2, 3] [4]. Literature studies reviewed e-government maturity models and gave different results [3], [5, 6]. Fath-Allah [5] completed a comparative study of selected e-government maturity models, from the results the author proposed what he called a best practice based e-government portal maturity model. Siau & Long [6] performed a meta-synthesis study on five existing e-government maturity models and derived a new e-government stage model. Finally, Lee [3] also conducted a qualitative meta-synthesis of 12 e-government stage models.

The creation of different metaphors and themes aids practitioners to plan future e-government projects. Several models are available to examine e-government

structure and functioning, but the uniqueness of the study is to create a new basis for a model that can be used by other researchers to develop new models. As a result, the paper has 17 different e-government maturity models are analyzed and selected carefully through the application of a 'Qualitative meta-synthesis' method. The synthesis technique is briefly explained in the next section. Sections 3 and 4 illustrate a comparison of the 17 models based on the year of publishing, the number of stages and the name of the stages. Section 5 presents the research synthesis, and finally, Section 6 outlines the conclusions. The main research questions and the methodology adopted are illustrated in the next section.

2. Methodology

Stern & Harris developed the qualitative meta-synthesis. [7]. It is used for the systematic review of various qualitative studies in a subject. The goal of the process is to develop an explanatory theory to analyze and explain the findings of a group of related studies [8,9]. The activity aims at aiding researchers to assess the manner in which different studies are related. The process has a number of stages [6] that are illustrated below. Because of the simplicity of this research, the analysis of the stages is combined. (e.g combining stage 2 with stage 3)

Stage 1: Identifying the Research Question

The stage involves the appropriate research question that fits the frame and purpose of the meta-synthesis selected.. The research will examine 17 e-government models in order to find commonalities among them. The research answers three main questions namely:-

- Q1: Are there common stages among the 17 selected models?
- Q2: What are the main common maturity level variables that can be noticed when moving from one stage to another?
- Q3: Do the existing 17 selected models have drawbacks?

Stage 2 & 3: Identifying the Literature Relevant to the Research Question and Appraise the Studies

The stage incorporates Google Scholar, Web of Science, and Scopus as the main sources of literature. An initial search produced a large number of articles that discussed e-government models. The majority of them explained and discussed the selected 17 models. The authors were able to understand the thought process of the scholars who proposed the various models by assessing the articles. Later on, several documents that discussed and analyzed the model were also obtained. Around 200 journal articles, books, and reliable websites were selected for the research.

The examination of the study depths together with pre-mediated criteria that were framed earlier takes place on stage 3. The goal of the research was to select articles published in reputable journals and conferences that discussed the 17 chosen maturity models. Ideally, the selection criteria were strengthened and made stricter. The quality of research, the number of references and the quality of journals were repeatedly evaluated. The list of 200 articles was further reduced to 130. These were high-quality articles written by academics of good reputations.

Stage 4,5,6,&7: Determining How The Studies Are Related, Translating The Studies Into one another, Synthesis of Translation and Presenting the Findings

Steps 4 and 5 are core steps during the meta-synthesis approach [6]. 17 different e-government models are compared in the two stages. The comparison is made by identifying each model. A table that shows each model's year, stage number and the name of the stage is constructed. Details of the model such as representation, the explanation for maturity and development are compared and contrasted. The illustration of the process takes place in sections 3 and 4 of the paper. Finally, in the last two steps, the findings from steps 4 & 5 are synthesized and the translated. The main results and the conclusions are illustrated in Section 5.

3.E-government Models

The section presents an analysis of various e-government models. A descriptive account of the models is presented and then section 4 provides a comparison review.

Layne and Lee: Layne and Lee [10] proposed a four-stage model to explain the development and evolution of e-government. They proposed four stages of growth namely, cataloging, transaction, vertical integration, and horizontal integration. The model is placed on an XY plot. The X-axis has the dimensions of sparse, integration, and complete while the Y-axis has the dimensions of simple and complex [11]. The main criticism of Layne and Lee model is that the focus is on technology, and shifting the inefficient bureaucracy to an online mode [29][2][6]

Hiller and Belanger: Hiller and Belanger [14] proposed a five-stage maturity model for e-government. The model has more details than other models in such a way that it examines the convergence of the stages together with the relations between the government and its components. The five stages include information, two-way communication, transaction, integration, and political participation. The focus is on maintaining the privacy of individuals and the government apparatus. Hiller and Belanger model is mainly speculative, and technology based. There is no effort to understand the citizens' needs; there is a lack of accountability and urgency from the government staff. [30]

UN: The United Nations five-stage model developed after an intense survey of more than 193 United Nations member countries. The model presents a realistic picture of e-government maturity [15]. The model is somewhat similar to other mentioned models. The model has five stages, and they represent the stages of emerging economies to the highly developed countries. The five stages include emerging presence, enhanced presence, interactive presence, transactional presence, and seamless or fully integrated presence.[15] The UN model is developed from practices in 193 countries, and the model was developed as a post observation of the practices in these countries [31] that could be conspired ad a drawback of the model.

IBM: IBM with its deep insights into understanding user requirements and application building, proposed four stages to capture e-government maturity, which are automate, enhance, integrate, and on-demand. IBM uses its commercial expertise to propose a model that resonates with today's market needs. The model suggests that evolution and maturity must be viewed as three waves of change. The first two stages (automate and enhance) capture the accessibility of services while the integration and on-demand stages capture market needs [16]. The IBM model does not consider social improvement and social welfare, as the main objective of the government. In many instances, it is not possible to develop metrics for costs, benefits, and weigh them on a cost/ benefit ratio [32]

Cisco: Cisco is one of the leaders in providing web applications and connectivity solutions proposed the three-stage model to understand e-government maturity. The model is an evolving one, and it has three stages namely, information interaction, transaction efficiency, and transformation [17]. Cisco model prudently keeps the future evolution and maturity open [33]. This indicates that further stages are possible in the model.

Accenture: Accenture is one of the leading management consultancies and software development firms developed a five-stage maturity model. The model was developed to rank the e-government systems of a number of countries such as Canada, Singapore, Brazil, and Mexico. The five stages represent online presence, basic capability, service availability, mature delivery and service transformation [18]. Accenture model gives a result of the evaluation of eGovs of different countries. While Canada occupies the top position, countries such as Brazil and South America are the bottom layer [34]. The model does not consider the technical and intellectual capital of the nation, the huge population, and the needs of the people.

PWC: The PWC, Price water House Coopers, the model was framed after a deep and comprehensive analysis of 50 e-government systems in various USA states. The accompanying documentation reveals a wide depth of research into the intricacies of government portals. The model has five stages namely, customer service, services organization by events, customization, diversity management and legitimacy [19].

PWC model is mainly academic, since the model presents the current practices of eGovs in USA. The model does not suggest interoperability [35]

Ernst and Young: Cap Gemini and Ernst & Young developed the model in response to a request from the European Commission DG Information Society [20]. A survey was conducted among 15 Europe member nations to assess the features, characteristics, and functionality provided by the e-government portals. The main shortcoming of Ernst & Young model is that it represents findings from a survey, and shows the status of eGovs [36] There is no way to understand the progress and path used for maturity. The stages indicated are stops, with no methods to indicate how they are linked [37].

Moon: The Moon model [2], developed during the early stages of e-government evolution, and it has five stages. The model was developed after Moon surveyed a number of municipalities in the USA, to understand the manner in which e-government evolved and the services they offered. The stages of the model include simple information dissemination with one-way communication, two-way communication with request and response, service and financial transactions, integration, and political participation [2]. It is clear that the Moon model that was developed in 2002, does not consider modern developments such as social media, e-commerce, knowledge management and collaboration [38]. There is no indication as to how the portal will connect with other municipalities and state portals [39].

The World Bank: After consultation with its member nations, The World Bank developed a three-stage maturity model. The steps include: publish, interact, and transact [21]. The model is simple but considers that all the three phases are interlinked. In the first stage, information is published on the net. The information includes forms, documents, regulations, rules and facilities. Interaction makes up the second stage, users can provide feedback and comments on the policy, rules and proposals. The third stage involves a transaction, where users can complete secure online transactions [22].

The UK National Audit: The UK government developed this model in 2002 to facilitate the transformation of over one hundred e-government portals in the country. The model has three main steps. The second step has four sub-steps. The first step is basic information provision, the second step is made up of sub-steps which include interactive, account management, e-publishing, and basic transactional capability, and the third step captures complex transactional capability [23]. The censure of the UK National Audit Model is that it assumes that all government portals and departments take up transactions [40]

The modified UN: This model was designed after a survey of 193 member nations to understand the manner in which e-government systems were formed. The features of the services and the method are used to reach maturity. The model has four stages

namely, emerging information services, enhanced information services, transactional services, and connected services [24,25].

Alhomod & Shafi: Alhomod & Shafi [26] developed a four-stage maturity model to explain the manner in which e-government developed. The stages include presence on the web, interaction between citizen and government, complete transaction over web, and integration of services. The main criticism of Alhomod model is that while the model was developed in 2012, there is nothing new or revealing, and the same ideas are rehashed [41]

Lee & Kwak: This five stage model extends e-government systems to include social media and web 2.0 tools. The model was developed from research into the US Healthcare Administration agencies. The five stages are initial conditions, data transparency, open participation, open collaboration, and ubiquitous engagement [27]. The main disadvantages of Lee & Kwak about the model is that while e-voting and e-petitioning are encouraged from the public, the manner in which the feedback is used is not clear [42]

Chen: This model with three stages was proposed after research into e-government activity in China [28]. The three stages include catalogue, transaction, and vertical integration. The catalogue stage involves the establishment of online presence an online presence is established, with presentation and downloadable forms. During the transaction stage, databases are provided along with an interface for online transactions. In the third stage of vertical integration, other departments of the government are integrated [28]. The shortcoming of Chen model is that the linear model adopts a standard approach for model development [4] There is no indication of external and internal drivers that guide the government into setting up a portal. Relations with private enterprises, and citizens, and the mechanisms are not explained [43]

Wescott: The model has six stages. It was based on the development of e-government systems in the Asia-Pacific region. The six phases are setting up an email system and internal network. The purpose was to enable inter-organizational and the public to have access to information. It allows 2-way communication leading to an exchange of value, digital democracy, and joined-up government [12]. Wescott finds very little application among many Asia pacific nations, since many of the countries are at the initial stages [44]. The model suffers from lack of clarity since it does not explain the nature of exchanges between the government and the people, and if only directives are issued [45].

Kim & Grant: The model has five stages namely, web presence, interaction, transaction, integration, and continuous improvement. The model was developed by considering inputs from four sources, human capital, structural capital, relational capital, and IT investment. The model considers the combination of these sources to help define the maturity of the e-government [13]. Kim & Grant model does not reflect

the insight into the manner in which technology adoption is practiced by the users[46]. All the efforts appear to be government directed, and users have very little control over the contents of the portal [47]

4. Comparing the Models and Translating the Studies into one Another

The majority of the models have four or five stages. Only Westcott model has six stages. Almost all the models have a lot of common features and similarities among them. Although the maturity model stage names are different, their contents are very similar [5]. Many models were developed during 2002-2006 when many tools and applications such as social media, and other collaboration tools had not yet evolved. Only a few models such as Lee and Kwak maturity model introduce the use of such new tools including social media. Apparently, a common pattern is observed in all the models.

The initial stage is considered as the basic e-government stage. In most of the models the first stage is called catalogue, presence or information (e.g. [2],[10], [14,15,16,17,18,19,20,21],[23], [25,26,27,28], and [13]). The main function of this stage represents e-government as a form of a simple portal with a one-way communication technique. Information is provided for some basic announcements and news about government plans, schemes, and other aspects. The Wescott [12] model captured an initial stage before the presence. It is called “setting up the network system.” This is an initial stage that captured the complex technical and website-use related preparation and coordination work before moving on to the second stage that describes the presence of the actual information.

Ideally, the middle stages point to more development and refinement. The stages capture governments’ efforts to use an online portal to provide citizens with a method to carry out simple transactions. Most models have more than one middle stages that range from the level of interaction between the government and the citizens, such as [14, 15], [18, 19, 20, 21], [2],[23], [25,26], [13], and [27]. Some models (e.g. [10], [16, 17], [28], [12]), have a stage that allows a higher level of interaction between the government and the citizens (e.g. transaction, two-way communication, etc.).

The last stage, commonly seen on all models is that of integration of services. Three models (e.g. [3], [19] and [12]), have gone beyond the integration stage. They introduced a political function stage in which citizens are allowed to e-vote and engage into the political system.

5. Conclusions and Research Synthesis

In conclusion, The stage models have several common features and similar stages. None of the models present anything new. Most models have three main stages that capture presences, communication, and integration. The table below shows the

mapping of each model's stage to the three proposed main stages (presence, communication, and integration)

Table 1: Mapping the stages

Model	Year	Presence stage	Communication stage	Full integration stage
Layne and Lee	2001	1) Catalogue	2) Transaction	3) Vertical integration 4) Horizontal integration
Hiller and Belanger	2001	1) Information	2) 2-way communication 3) Transactions	4) Integration 5) Participation
UN e-government Maturity	2001	1) Emerging presence 2) Enhanced presence	3) Interactive presence 4) Transactional presence	5) Fully Integrated Presence
IBM	2003	1) Information	2) Transaction	3) Internal integration 4) External integration
CISCO	2007	1) Information	2) Transaction	3) Transformation
Accenture	2003	1) Online presence 2) Basic capability	3) Service availability 4) Mature delivery	5) Service transformation
PWC	2002	1) Customer service	2) Service organization 3) Customization 4) Diversity management	5) Legitimacy
Ernst & young	2003	1) Information	2) One way interaction 3) 2-way interaction 4) Transaction	
Moon	2002	1) Information	2) 2-way communication 3) Service and financial transaction	4) Vertical and horizontal integration 5) Political functions
World bank model	2003	1) Publish	2) Interact 3) Transact	
The UK national Audit	2002	1) Basic site	2) E-publishing	3) Holistic e-govt
The Modified UN model	2012	1) Emerging information services	2) Enhanced information services 3) Transactional services	4) Connected services
Chen	2011	1) Catalogue	2) Transaction	3) Vertical integration
Alhomod	2012	1) Presence on the web	2) Interaction between the citizens and the government 3) Complete transaction over the web	4) Integration of services
Kim & Grant	2010	1) Web presence	2) Interaction 3) Transaction	4) Integration Continues improvement
Lee & Kwak	2012	1) Initial conditions	2) Data transparency 3) Open participation 4) Open collaboration	5) Ubiquitous engagement
Wescott	2001	1) Setting up an email system and internal network 2) Enabling inter-organizational and public access to information	3) Allowing 2-way communication	4) Exchange of values 5) Digital democracy 6) Joined up government

There are two major maturity level variables that are emphasized in the literature. These are level of interaction and level of complexity. The level of complexity has been explained to entail the extent to which the level of difficulty increases with the advances of e-government stages. For example, the last stage, full integration, is meant to be the most complex stage as it involves advanced services and integration between all departments. The second aspect is the level of interaction. The level of interaction can be explained to be the extent to which interaction between citizens and government increases with the advances of e-government stages. For instance, the first stage, presence, requires no interaction while the middle stage requires interaction between the citizens and the government.

Finally, as mentioned previously the models have some drawbacks that can be summarized into the following. The models adopt a stop and jump procedure, where the portal starts at one stage and then jumps to another. There is very little clarity on the prescriptive nature of change required, the transformation strategies to be adopted, and the requirements for progress to be made from one stage to another. Also, all the models indicate that government are interested in automating routine procedures such as filing taxes, paying bills, and completing other tasks. There is very little effort to research citizens' requirements, and address them. In addition, the models do not explain how people from disadvantaged sections of the society, and those in rural areas, are able to access the e-government portal and make use of it. It is clear that e-government caters to the urban literate. None of the models speak of development effort needed to make IT available to wider sections of society. Moreover, there is no mention of developing infrastructure, hardware, software, and increasing connectivity. Issues such as accountability, time taken to resolve issues, corruption, metrics and benchmarks, are not mentioned in the models. Furthermore, Most of the models do not consider inputs from social media or have mechanisms to address complaints, suggestions, and comments from the public. Finally, the models largely focus on information and transactional capability of processes that have a statutory requirement either on the part of the citizen or government and ignore how e-government deals with more complex services such as healthcare, social services or education

6. Research Contribution and future work

This study aimed at providing a review of the key e-government maturity models discussed in the literature together with a summary of current research in the field. The motivation for this review is to highlight some of the commonalties among the current models and prepare the basis for capturing some of the broader dimensions of public sector services that need to be facilitated through e-government. The review performed a study that contributes a qualitative meta-synthesis in this field. This review could assist researchers who are seeking knowledge and references to develop new maturity models by providing them with useful resources for further investigation and study. Finally, as part of future research, the motivation for this review is to highlight the basis for formulating an e-diplomacy maturity framework, which is the integration of ICT

into the ministry of foreign affairs and the function of diplomacy, which will be formulated based on the theory and practice of e-government maturity models.

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