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Towards a Measurement-Based E-Government Portals Maturity Model

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***Abstract*—**The e-government emerging concept transforms the way in which the citizens are dealing with their governments. Thus, the citizens can execute the intended services online anytime and anywhere. This results in great benefits for both the governments (reduces the number of officers) and the citizens (more flexibility and time saving). Therefore, building a maturity model to assess the e-government portals becomes desired to help in the improvement process of such portals. This paper aims at proposing an e-government maturity model based on the measurement of the best practices' presence. The main benefit of such maturity model is to provide a way to rank an e-government portal based on the used best practices, and also giving a set of recommendations to go to the higher stage in the maturity model.

***Keywords*—**Best practices, e-government portal, maturity model, quality model.

I. Introduction

THE World Bank defined e-government as: "*the use by government agencies of information technologies like wide area networks, the internet and mobile computing that have the ability to transform relations with citizens, businesses, and other arms of government*" [1]. While, the United Nations (UN), defined it as: "*the use of ICT and its application by the government for the provision of information and public services to the people"* [2]. In this paper, the e-government is defined as the use of e-portals to deliver government services to the citizens using the internet.

E-government can transform the way in which citizens are dealing with governmental offices. This means that citizens can complete transactions without visiting those offices. This offers citizens a way to request or execute services online. With the traditional government portals, the provided services need a lot of paperwork and human interaction with officers who are required to conduct such transactions. This means that citizens have to leave their jobs for many hours. Hence, making these services accessible via the internet will result in great savings for both governmental entities and citizens. However, building an e-government portal that is not used by citizens will be a loss for both governments and citizens. Thus, to be able to get the highest benefits from using e-government, the best practices which have been implemented worldwide for building e-government portals should be considered. In addition, giving directions for agencies to assess and improve the quality of their e-services will be of high value.

In literature, there are many maturity models which have been used to assess e-government portals. From the international level, the United Nations has published e-government benchmarking reports of United Nations' member states, the latest one is the 2012 benchmarking report [3]. Their maturity model is composed of four stages [3]. From the European level, the European commission has published the European benchmarking report by Capgemini on 2009 [4]. Their maturity model is composed of five stages. From the academic level, various maturity models have been built, for example: Layne and Lee [5], Andersen et Henriksen [6], United Nations [3], Alhomod [7], Hiller and Belanger [8], Almazan and Gil-Garcia [9], Cisco [10], Gartner [11], West [12], Shahkooh [13], Howard [14], Lee and Kwak [15], and Siau and Long [16].

Although there are many maturity models for assessing e-government, not all of them focus on the same set of best practices. Many maturity models include some best practices while they just ignore other important best practices. Furthermore, these maturity models are not based on a best practice framework or quality model and they are not based on measurement of best practices.

This paper will analyze three e-government maturity models and discuss their weaknesses and limitations. At the same time the paper will propose a base for a new maturity model to overcome those limitations.

This paper is structured as follow: Section II provides a general overview of some maturity models from literature followed by a comparison between them. Section III explains the architectural view of the proposed maturity model. Section IV describes the procedural view of the proposed maturity model. Finally, Section V concludes the paper and gives directions for future work.

II. E-Government Maturity Models: A General Overview

This section provides an overview of some evolutionary maturity models that focus on e-government development and growth, followed by a discussion of their advantages and drawbacks, and how the proposed maturity model will solve those drawbacks.

This section provides details of a sample of 3 maturity models to show how they differ in stages, content and purposes as follows.

Layne et Lee [5] developed a four stages maturity model of

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e-government. The maturity stages are as follows:

1) The 1st stage is "Catalogue": At this stage the public authority is presented on the web, the user can download forms and also consult presentation catalogs.
2) The 2nd stage is "Transaction": At this stage, the citizen can make transactions with the government by filling forms with a confirmation of receipt from the governments. In addition, the user can talk to officials through online forums.
3) The 3rd stage is "Vertical integration": This stage involves integration to higher level systems within similar functionalities or jurisdictions.
4) The 4th stage is "Horizontal integration": At this stage, Systems are integrated across various government jurisdictions, the portals are real one stop shops for citizens.

In the 2012 United Nation's e-government survey [3], e-government was divided into a four stages maturity model as follows:

1) The 1st stage is "Emerging information services": In this stage, government websites provide static information. Laws, regulations, relevant documentation and information on public policy can be easily accessed through the portal.
2) The 2nd stage is "Enhanced information services": In this stage, the presence is enhanced with one way or simple two way communication like downloadable forms. The portal features multilingual audio and video clips.
3) The 3rd stage is "Transactional services": In this stage, a two way interaction with citizens is possible. Citizens' identity is required at this stage to complete the transactions. Secure online payments are available at this stage.
4) The 4th stage is "Connected services": In this stage, websites are citizen centric and proactive in requesting citizens' feedback via web 2.0 tools. Citizens are more involved in government activities and decision making (e-participation).

Lee and Kwak [15] proposed a five stages maturity model. This model focus on open government and the use of social media and web 2.0 tools. The maturity stages of this maturity model are as the following:

1) The 1st stage is "Initial conditions": This stage is a one way static interaction with the citizen. It is only used for broadcasting information to the public.
2) The 2nd stage is "Data transparency": At this stage feedback is get from the public on usefulness and data quality.
3) The 3rd stage is "Open participation": This stage features social media tools to increase open participation. Input from the public is welcomed and used in policy decisions. Data privacy and security is enhanced at this stage.
4) The 4th stage is "Open collaboration": This stage features interagency collaboration by sharing data and public input. Public contests are organized and shared repositories are made available.
5) The 5th stage is "Ubiquitous engagement": At this stage, data is easily accessed by mobile devices and tablets. Portals and social media sites are compatible with various platforms. Data is vertically and horizontally integrated and data analytics is used for decision making processes.

Regarding this sample of three e-government maturity models including Layne et Lee [5], United Nations [3] and Lee and Kwak [15], we can see that all of them propose a staged maturity model, with different stages, ranging from 1 to 4 or 5. Moreover, the stages' names are different from one maturity model to another although their content may have some similarities and differences. For instance, the first stage for Layne and Lee [5] is "Catalogue" where the public authority is presented on the web, while for United Nation [3] this stage is "Emerging information services" where government websites provide static information, and for Lee and Kwak [15] this stage is "Initial conditions" and is about broadcasting information to the public. Table I provides a summary of the three e-government maturity models levels.

TABLE I
THE THREE MATURITY MODELS STAGES

Stage / Model	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Layne and Lee [5]	Catalogue	Transaction	Vertical integration	Horizontal integration	N/A
United Nation [3]	Emerging	Enhanced	Transactional	Connected	N/A
Lee and Kwak [15]	Initial conditions	Data transparency	Open participation	Open collaboration	Ubiquitous engagement

A deep investigation of each maturity model (including the maturity models mentioned in the introduction) leads us to conclude that almost all of them contain best practices related to:

1) The availability of the portal in the Web.
2) Interaction or transaction with governments.
3) Advanced features such as information sharing between agencies, e-participation etc.

On the other hand, the following can be figured out from the investigation of these maturity models:

1) Not all of them focus on the same set of best practices. For instance, Lee and Kwak focus on open government and the use of social media while the UN and Layne and Lee maturity models are not.
2) Many of them include some best practices while they just ignore others. For instance, the e-voting is present in the UN and Lee and Kwak maturity models, while the Layne and Lee maturity model is ignoring this best practice. Furthermore, Lee and Kwak maturity model is introducing important aspects such as measuring performance and analytics for decision making, while the other maturity models are not.

3) All of them are not based on a quality model or framework.
4) All of them are not based on a best practice model.

Based on these findings, the need for a new maturity model is a necessity for both governments and citizens; which will be built based on the advantages and drawbacks of the existing maturity models. Therefore, a deep investigation of all the available maturity models in the literature from others different points will be useful. Such new or proposed maturity model, to which we will refer to, henceforth, as MBeGPMM (Measurement-Based e-Government Portals Maturity Model), will include, among others features:

1) Quality model and associated measures.
2) Best practices model.
3) Staged maturity model.
4) Guidelines to identify the weaknesses of e-government portals at any maturity stage
5) Set of recommendations to help agencies move to higher stages of maturity.

III. MBeGPMM: A General Architectural View

To build the MBeGPMM, first we need to build the BPM (Best Practice Model) which is based on e-government portals' best practices and then build the MBeGPMM which use the BPM plus the e-government quality model composed of characteristics, sub characteristics and measures.

A. MBeGPMM Architecture

The new maturity model will be based on a set of e-government best practices or a best practice model that needs to be collected from the literature. However, we noticed that the best practices that exist in the literature are not harmonized or logically structured. This makes the first challenge of this work; i.e. categorization of those best practices in a logical way to be able to build a best practice model. Next, those best practices can be mapped into the maturity stages of the maturity model.

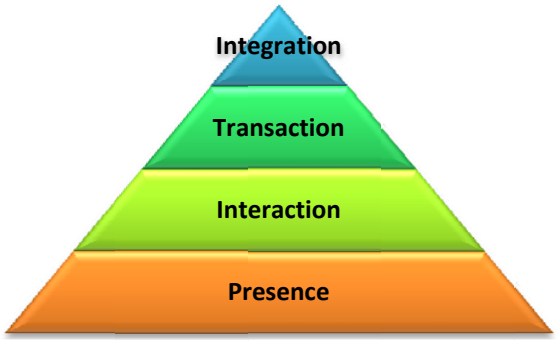

Fig. 1 Maturity stages of MBeGPMM

From the study of the sample of three maturity models in the previous section and other maturity models in literature as stated in the previous section, we can notice that we can classify the maturity stages into four stages (as shown in Fig. 1) as the following:

1) Presence: At this stage the agency is available on the web.
2) Interaction: At this stage the citizen can interact with the government.
3) Transaction: At this stage the user can complete transactions over the web.
4) Integration: At this stage information is shared between agencies and the stage covers advanced features.

After collecting the e-government portals best practices, we will build an e-government quality model based on the best practice categories collected from literature. The quality model will be composed of quality characteristics, sub characteristics and measures. Next, those quality characteristics can be useful for the maturity stages of the maturity model. This way we will build the MBeGPMM.

B. Components of the MBeGPMM

The MBeGPMM is a hierarchical model with 5 levels. The first level is composed of four maturity stages as the following: presence, interaction, transaction and integration. Each maturity stage contains quality characteristics related to the corresponding maturity stage in the second level. Furthermore, each quality characteristic is composed of one or more quality sub characteristics in the third level. Moreover, each quality sub characteristic can be measured using one or more measures that can be in the form of a user survey in the fourth and fifth levels. Fig. 2 shows the components of the proposed MBeGPMM.

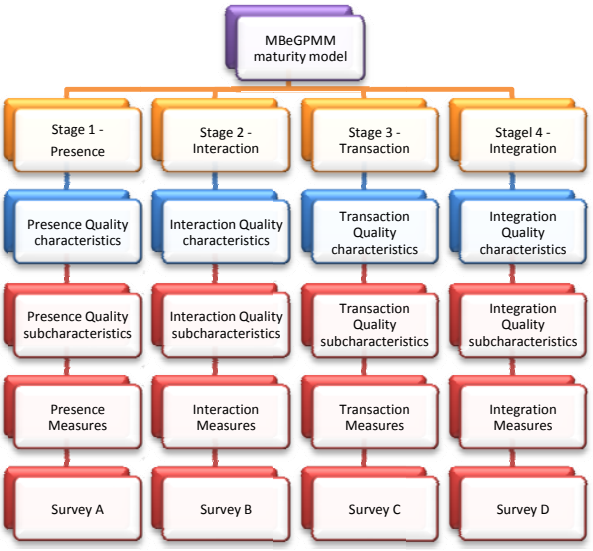

Fig. 2 Components of MBeGPMM

IV. MBeGPMM: A General Procedural View

At this level we have the quality characteristics, sub characteristics, measures and survey questions. In order to calculate the maturity stage quality of the e-government portal, we need to compute the quality levels of the quality characteristics corresponding to each stage. The process to follow is shown in the Fig. 3 and described as follow:

1) The first step is to define the maturity stage to be

measured. When this process is executed first time, the chosen stage is 1 "Presence".

2) Next, the survey corresponding to the maturity stage being measured can be executed by the portal's admin.
3) Afterwards, the quality level of each quality sub characteristic can be measured using the output of the user survey.
4) Then, the quality level of each quality characteristic can be measured using its corresponding sub characteristics quality levels.
5) After, the quality level of the selected maturity stage can be calculated.
6) Finally, the best practices can be identified and implemented to move to the next stage of maturity.

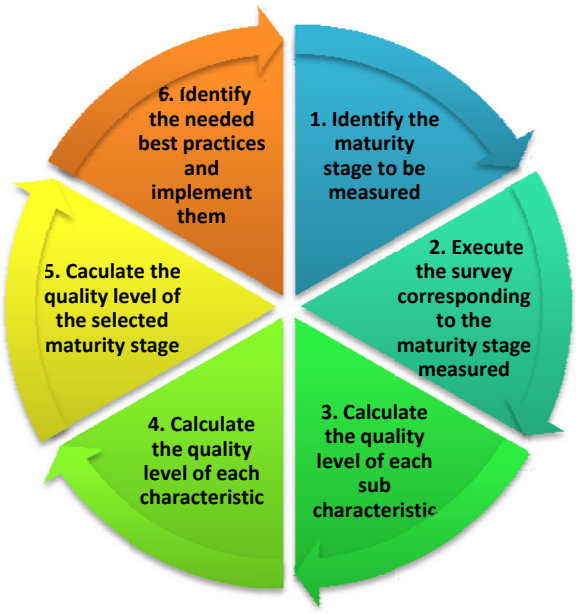

Fig. 3 MBeGPMM procedure

This process is cyclic and can be repeated to move to a higher stage of maturity [17].

Besides that, this maturity model will allow us also to calculate the quality level of the whole e-government portal, based on the quality level of each maturity stage. As a result the benchmarking studies can be done from two aspects: e-government portals bests practices and e-government portals quality levels.

V. Conclusion

In this paper we have presented and analyzed some maturity models from literature. We concluded that those maturity models suffer from some weaknesses and limitations such as:

1) They are not based on a measurement based quality model to help agencies identify the stage of maturity.
2) They are not based on a best practice model to help agencies identify the missing best practices to implement at each stage of maturity.

In addition, the paper proposes a maturity model that will overcome those limitations. We first have described the architecture of the MBeGPMM which is based on a best practice model and a quality model. Besides that, we have described the maturity stages of the MBeGPMM that are: presence, interaction, transaction and integration. Then, we have described the components of the MBeGPMM which are: maturity stages, quality characteristics, quality sub characteristics, measures and surveys. Finally, we have proposed the procedural view of the MBeGPMM and described the cyclic process of the maturity model that allows calculating the quality level of each maturity stage using the quality model and determining the best practices needed at each maturity stage using the best practice model.

As a future work, we will build an e-government portals' best practice model and a quality model composed of quality characteristics, sub characteristics, measures and survey questions to be able to build the MBeGPMM.

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