TOWARDS CUSTOMIZED SMART GOVERNMENT QUALITY MODEL

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ABSTRACT

Smart government *is the next generation of the e-government that touching people closely in the perception of service quality. Although, the existing a varies of models that able to measure the level of normal quality,* ***but there is a lack*** *of the models that most needed for measuring the quality of Smart Government Services However, to build a smart government, it is crucial to take the quality into consideration.* ***This paper aims*** *o customized quality model for smart government. Building such quality model will be based on the available software quality models for smart government portals.* ***To achieve the aims*** *of the research, it was critical to analysis and obtain the intersection of the variable and sub variable form the key related models (McCall's,Boehm, Dromey, FURPS and the ISO 9126 Quality Model. It will consist of the most appropriate and related quality characteristics and sub characteristics.* ***The key finding*** *has indicated the importance of conducting practical study for proposing novel model for these purposes*

KEYWORDS

SMART Government, E-Government, Quality Model

1. INTRODUCTION

Smart-government is also known as m-government (m stands for mobile). It called m-government because it is available everywhere. The use of mobile devices such as Mobiles, Tablets, Pads, etc. is the key point the Smart Government. Therefore, the Smart Government can be referred as 'm-Government' term.

Despite its beginning, M-Government seems to have an important effect on the creation of set of strategies and tools for E-Government strength, and on their roles and functions. The usage of mobile phones with internet connection (smartphones) is increasing quickly [1]. A very recent research report written by the UN shows that there are 1.5 billion smartphones users in the whole world which counted as about 21% of all mobile users in 2013, and this number is increasing exponentially in many countries [2]. Nowadays, the smart mobiles are a conventional part of human daily life, and they can be used anywhere any time, and therefore, the governments in many countries around the world just provides many of their services via the internet.

In literature, M-Government has different definitions, for example, Martin *et al.* [3] defines M-Government as "*a strategy that consist of the implementation of all kinds of wireless and mobile technologies, applications and devices for improving services delivery to the different stakeholders involved in E-Government including citizens, businesses and all government units*". In addition, Sandy and McMillan [4] define M-Government as "*the application of wireless mobile communication technologies of government and public-sector organizations and provision of services and sharing information to other organizations and citizens*". Furthermore, Jahanshahi *et*

al. [5] define M-Government as "*a way to provide a suitable and reliable infrastructure for citizens to access services easily through providing significant tools for implementing the M-Government activities, thus results in giving better opportunities to people to participate in social events and activities*".

Smart government can provide many services to the citizens and residents, for example. It can provide services for the following [6]:

- Health
- Education
- Security
- Filing claims and reporting problems
- Information inquiry
- Schedules

Smart government portals and applications are in turn software products. However, the "*software Quality*" term is defined by the IEEE [7] as "*the degree to which a system, component or process meets specified requirements and customer (user) needs (expectations)*". In addition, it has been defined as "*conformance to explicitly stated functional and performance requirements, explicitly documented development standards, and implicit characteristics that are expected of all professionally developed software*" [8]. Furthermore, ISO defines "quality" in ISO 14598-1 [9] as "*the totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs*". In addition, it was defined as "*the existence of characteristics of a product which can be assigned to requirements*" [9].

In literature, there are many quality models for software products; each of such quality models contains a set of quality characteristics (attributes or factors, as called in some models). Next section will discuss the components of the following five quality models:

- McCall's Quality Model [11]
- Boehm's Quality Model [12, 13]
- Dromey's Quality Model [14, 15]
- FURPS Quality Model [16]
- ISO 9126 Quality Model [17]

In this paper, the above quality models will be analyzed and discussed in order to be used in building the proposed quality model for the smart government portals and applications. However, the most related and important characteristics and sub-characteristics from these quality models will be customized and added together to form what will be called Smart Government Quality Model (SmartGQM).

The rest of the paper is organized as the following: Section 2 will discuss the related quality model the available quality models. Section 3 will introduce the proposed quality model for the smart government. Finally, section 4 will conclude the paper.

2. RELATED QUALITY MODELS: AN OVERVIEW:

2.1. MCCALL'S QUALITY MODEL

McCall's Quality Model McCool is one of the most famous quality models in software engineering literature. It was presented by Jim McCall *et al.* [11]. This model stems from the US military and is primarily aimed at system developers and system development process [11]. Using

this model, McCall tries to bridge the gap between users and developers by focusing on a number of software quality factors that reflect user views and developer priorities [11].

The McCall's quality model contains of three major perspectives (types of quality characteristics). Which can be used for defining and identifying the quality of a software product, and each of these major perspectives contains of a number of quality factors (characteristics ore attributes). However, each of these quality factors contains a set of quality criteria, and thus, each quality criteria could be replicated by one or more metrics.

McCall's Quality Model consists of:

- 11 quality factors to describe the external view of the software (from the users' view)
- 23 quality criteria to describe the internal view of the software (from the developer's view)
- Set of Metrics which are defined and used to provide a scale and method for measurement.

However, the quality factors structure of the McCall's Quality Model should provide a comprehensive quality picture of the software product [17]. The related quality metric can be measured by responding to "yes" and "no" questions. However, you will achieve 50% on that quality criterion if you respond to equally amount of "yes" and "no" on the questions measuring it.

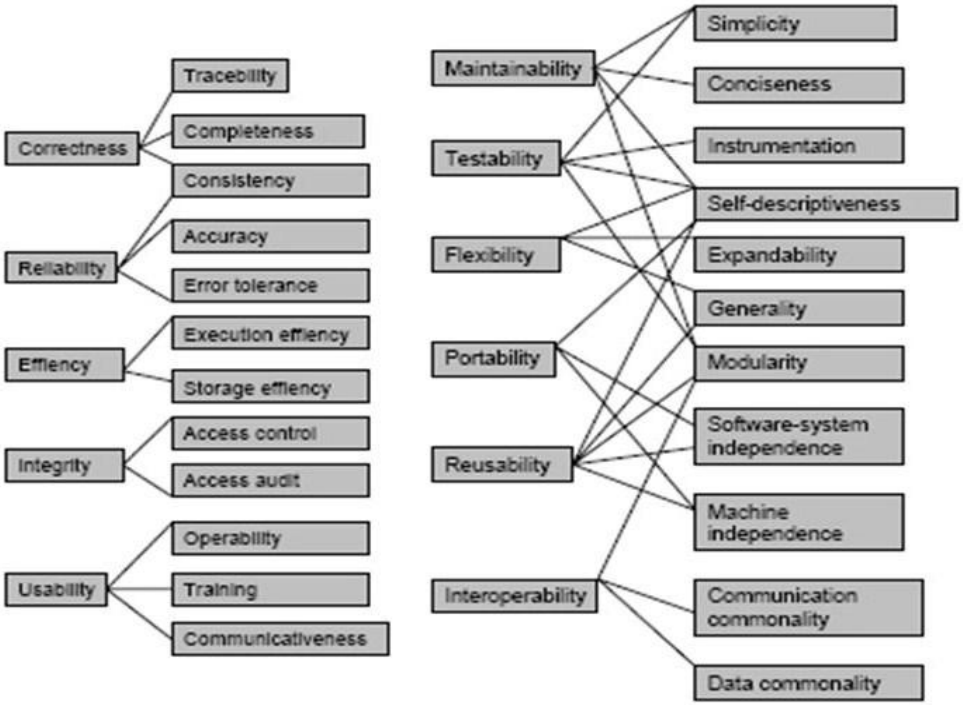

Figure 1. McCall's Quality Model [11]

2.2. BOEHM'S QUALITY MODEL

Boehm [12, 13] introduced his quality model to automatically and quantitatively evaluate the quality of software. This model tries to define the quality of software by a predefined set of

attributes and metrics. Boehm quality model contains a set of characteristics of the following types (see Figure 2):

- Three High-level characteristics
- Seven Intermediate level characteristics
- Fifteen Lowest-level characteristics.

These set of characteristics can contribute to the overall quality level of software product. However, the high-level characteristics in this model represent the simple high-level requirements of actual use. In its high-level, there are three characteristics which are [12, 13]:

1. As is utility: to identify how well, easily, reliably and efficiently can we use the software product as is
2. Maintainability: to identify how easy is it to understand, modify and retest the software product
3. Portability: to identify if can we still use the software product when the environment has been changed?

High-Level Characteristics	Intermediate-Level Characteristics	Primitive Characteristics
As-is Utility	Reliability	Self Containedness
		Accuracy
		Completeness
		Robustness/Integrity
		Consistency
	Efficiency	Accountability
		Device Efficiency
		Accessibility
	Human Engineering	Robustness/Integrity
		Accessibility
		Communicativeness
Portability		Device Independence
		Self Containedness
Maintainability	Testability	Accountability
		Communicativeness
		Self Descriptiveness
		Structuredness
	Understandability	Consistency
		Structuredness
		Conciseness
		Legibility
	Modifiability	Structuredness
		Augmentability
3 High-Level Characteristics	**7 Intermediate-Level Characteristics**	**15 Distinct Primitive Characteristics**

Figure 2. Boehm's Quality Model [12, 13]

2.3. DROMEY'S QUALITY MODEL

Dromey's [14, 15] quality model was built for the software product rather than the software process. It recognizes that the quality assessment differs for each software product and that a more dynamic idea for modeling the software process is needed to be extensive enough to apply

for different software systems [14]. However, figure 4 below shows the quality characteristics of Dromey's model.

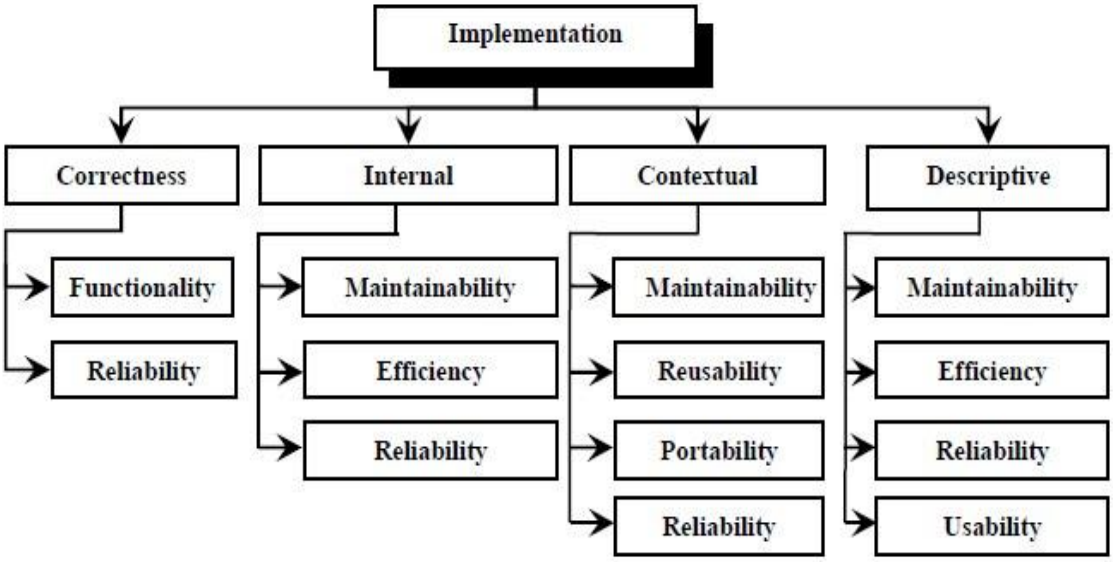

Figure 3. Dromey's Quality Model [14, 15]

2.4. FURPS QUALITY MODEL

The Functional, Usability, Reliability, Performance, and Supportability (FURPS) Model firstly introduced by Robert Grady [16], then it has been enhanced and improved by IBM Company in Rational Software [19, 20] to becomes FURPS+, where the '+' shows such requirements as (see Figure 4 below) [19]:

- Design constraints,
- Implementation requirements,
- Interface requirements, and
- Physical requirements.

Figure 4. FURPS Quality Model [16]

Figure 5 below shows the deep contents of each characteristic of the FURPS quality model five quality characteristics

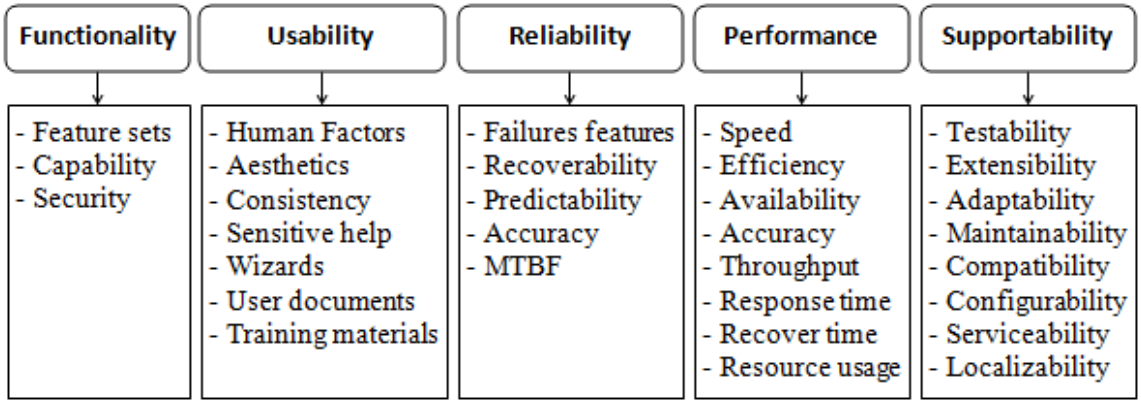

Figure 5. The detailed contents of FURPS quality model

2.5. ISO 9126 QUALITY MODEL

The International Organization for Standardization (ISO) published its first international agreement on the terminology for the quality characteristics for software product evaluation and assessment in 1991; this standard was called as "*Software Product Evaluation - Quality Characteristics and Guidelines for Their Use (ISO 9126)*" [17]. Next, between 2001 and 2004, the ISO introduced an extended version, containing both the ISO quality models and records of proposed measures for these models. The current version of the ISO 9126 series consists of the following:

1. ISO IS 9126-1: Quality Model [17].
2. ISO TR 9126-2: External Metrics [21].
3. ISO TR 9126-3: Internal Metrics [22].
4. ISO TR 9126-4: Quality in Use Metrics [23].

The part 1 of the ISO 9126 series - Quality Model – consists of two parts quality model for software product quality [17]; that is, internal/external quality model, and quality in use model.
The first part of the two parts quality model defines six characteristics. However, each one of these six characteristics is split into twenty seven sub-characteristics for both internal and external quality (see Figure 5) [18]. The next part of the two parts model specifies four qualities in use characteristics, as in Figure 6 [17].

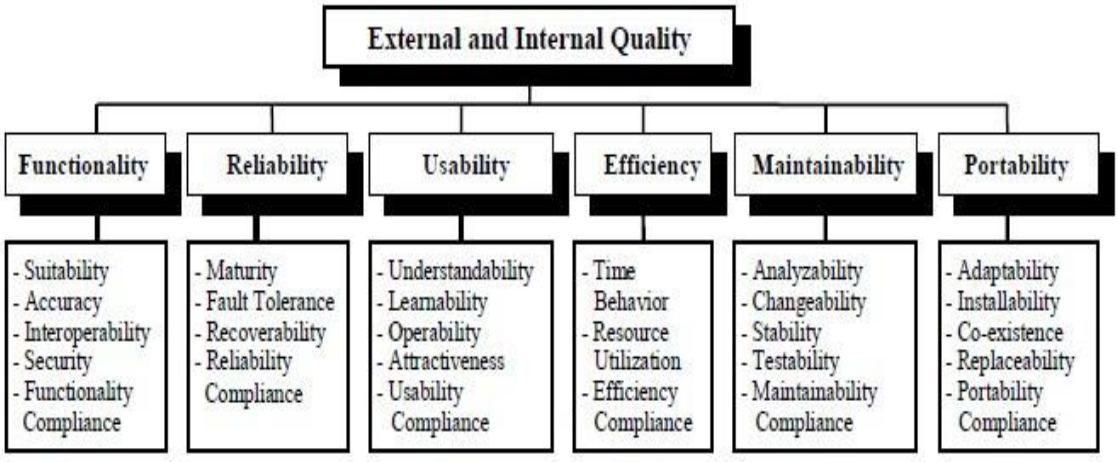

Figure 5. Internal and External Quality Characteristics and Sub-Characteristics [17]

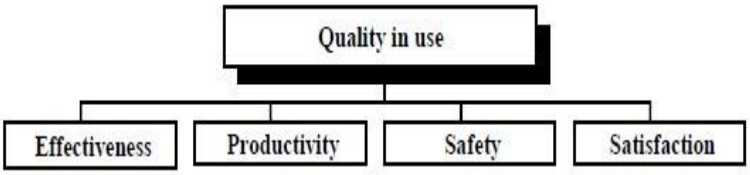

Figure 6. Quality in Use Characteristics [17]

3. The Customized SMART Government Quality Model

In this section, the structure of the proposed Smart Government Quality Model (SmartGQM) will be introduced. However, it will be based on the five-previous quality model (see Section 2). Figure 7 below illustrates the input resources which will be used to get the quality attributes for the proposed one.

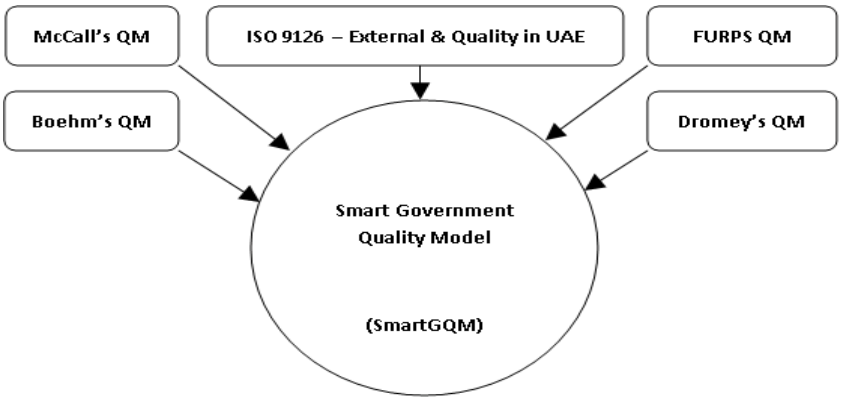

Figure 7. The inputs for the Proposed SmartGQM

The five quality models have been carefully analysed to determine which of their quality characteristics can be applied to measure the quality of the smart government portals and applications. Figure 8 below introduces the proposed contents of the Smart Government Quality Model.

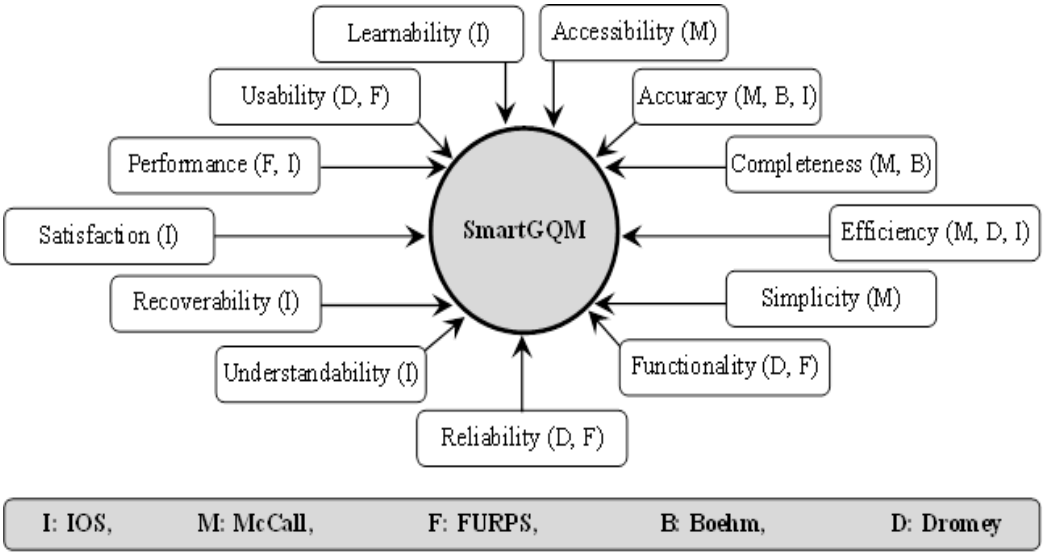

Figure 8. Smart Government Quality Model contents

4. CONCLUSIONS

Smart government is the next generation of the e-government. However, in order to build a smart government portal, it is crucial to take the quality into account. In this paper, a customized quality model for smart government has been proposed, building such quality model was based on the available software quality models. The proposed quality model for the smart government portals consists of the most appropriate and related quality characteristics and sub characteristics.

The proposed Smart Government Quality model consists of 13 quality characteristics. However, these quality characteristics have been chosen from the quality characteristics of five quality models. The selection was based on the related quality characteristics which can be applied to the smart government portals and applications, and which can be determined by the end user of the smart government.

Next, in future, this Smart Government Quality model will be used to build a novel maturity model for the smart government.

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