Chapter 20
A Semantic-Enabled Framework for E-Government Systems Development

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ABSTRACT

The ultimate goal of e-Governance is to reach the stage of seamless service delivery in one-stop e-Government. This raises the engineering issues of integration, reusability, maintenance, and interoperability of autonomous e-Government systems of government departments and agencies. Therefore, appropriate methodologies that consistently address the aforementioned engineering issues throughout clearly defined e-Government development phases are needed. This chapter provides the design and specification, of a framework that amalgamates features from maturity models, software engineering and Semantic Web domains for semantic-enabled development of e-Government systems. Firstly, the methods and techniques used for the planning, design, and implementation of e-Government systems worldwide are investigated; a critical analysis is carried out to identify their advantages and disadvantages, as well as their contribution towards addressing the aforementioned engineering issues. Secondly, the proposed framework is drawn and specified. Finally, support tools including a business process model, an alignment matrix of stages and phases of development, and a weighting matrix of the intensity of semantic activities at various phases of development is drawn and described.

INTRODUCTION

In recent years, many countries worldwide have adopted e-Governance, resulting in several Web-based applications being developed in various government departments and agencies for online services delivery to citizens. The increasing number of these autonomous e-Government applications has raised several software engineering issues such as reusability, maintenance, integration and interoperability of

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these applications (Choudrie & Weerrakody 2007; Saekow & Boonmee 2009). These applications have been raised in the context of one-stop e-Government which requires e-Government applications to be accessed at a single point and function as a whole for better efficiency and seamless services delivery (Wimmer 2002; Lee et al. 2009).

On the other hand, e-Government is a broad research field with several research works being undertaken in various domains (Lofstedt 2005). These research endeavours aim to address simultaneously political, institutional, legal, technological, cultural and societal issues for effective electronic services (e-Services) delivery to citizens. However, the development and deployment of e-Services in one-stop portal/shop remain a key and challenging priority in e-Government development. In fact, (1), e-Government strategies of various countries include e-Services development as a vehicle for effective online delivery to citizens and stakeholders.

In order to understand what it takes to implement e-Government, it is important to reference examples of successful e-Government implementation from countries such as Singapore (Devadoss et al. 2003), Australia (Teicher and Dow 2002), Taiwan (Sang et al. 2005) and UK (Beynon-Davies 2005); and (2), research studies reporting on successful e-Government implementation show that few countries have reached the stage of one-stop portal where citizens can seamlessly access all government's services (Chen *et al.,* 2006). Therefore, it is important to look at appropriate methodologies for developing e-Government applications which provides structured guidelines for the design, implementation and deployment of various government services on the Web to citizens, while consistently addressing the aforementioned engineering issues in an incremental and iterative manner, towards one-stop e-Government portals. A review of current literature in e-Government implementation has allowed identifying three main methods and techniques that deal with the planning, design, implementation and deployment of e-Services for effective online delivery to citizens. These include maturity models (MM), software engineering (SE) and Semantic Web (SW) techniques.

Considerable research has been conducted by public administrators for e-Government planning and implementation. These different researchers propose different stages for e-Government development in maturity models or ''stage of growth'' models (Layne and Lee 2001; Howard 2001; Deloitte and Touche 2001; Moon 2002; United Nation 2003; West 2004; Zarei et al. 2008; Bri 2009). A maturity model or 'stage of growth' model is designed as a sequence of stages of e-Government growth and constitutes a guiding and benchmarking tool for e-Government planning and development. Each maturity model stage prescribes a list of Web features that are needed online or mechanisms required to create changes at that particular stage of e-Government development. An example of e-Government initiative that has used the Layne and Lee (2001) model is the Integrated Acquisition Environment (IAE) e-Government project in the United States (Sang et al. 2005). The shortcoming of maturity models or 'stage of growth' models is that they lack design guidelines throughout their various stages. Furthermore, maturity models emphasize e-Government services integration at advanced stages of e-Government growth but they do not mention how this can be done. Despite their shortcomings mentioned above, maturity models provide useful methodological features for e-Government planning and development, especially at a higher level of abstraction (Estevez et al. 2007). However, the aforementioned shortcomings could be addressed with software engineering and Semantic Web techniques as described below.

In the software engineering field, it is believed that an e-Government application is a software system; existing software development methodologies (SDM) are used in e-Government projects and existing standards are employed for services integration and interoperability (Vassilakis et al. 2002; Heeks 2006; Janowski et al. 2007; Salhofer and Ferbas 2007; Sanati and Lu 2007; Arif 2008; Lee et al. 2009). Here and