E-Government Implementation of Ontology-Based Public Domain Data Knowledge Representation

Sotirios K. Goudos
Aristotle University of Thessaloniki, Greece

Efthimios Tambouris
University of Macedonia, Greece

Konstantinos Tarabanis
University of Macedonia, Greece

INTRODUCTION

The provision of electronic services is an important part of E-Business. This is equally true in the case of electronic government (eGovernment), since improvement of public service provision is an important political target worldwide. For example, in the European Union the proposed definition of eGovernment contains improving the quality of public services. In this respect, large amounts of funding has been allocated in the development of information systems for providing public services.

A number of models have been proposed to measure the maturity of eGovernment including public service provision. Abdoullah Fath-Allah, Laila Cheikhi,Rafa E. Al-Qutaish, and Ali Idri (2014) provide an extensive review of 25 eGovernment maturity models. This study suggests that in most models the first stage of maturity is considered to be the provision of information while more advanced stages include interaction and full transaction.

Peristeras (2006) suggests that public service provision can be divided in two distinct phases. The first phase, called informative, includes information about the public services. In this phase, citizens identify a public service and then obtain information about it, such as responsible authority for the service, required input documents, costs, communication channel, and the like. The second phase, called performative, includes invoking the public service and obtaining the result. It is clear that the first stage of proposed eGovernment maturity models correspond to the informative phase while the other staged correspond to the performative stage.

The vast majority of eGovernment systems target the performative stage. This is expected as this stage provides more benefits to the end-users (usually citizens or businesses). Is has been argued however that addressing the informative stage is also important. In addition, it can be a non-trivial task particularly for complex public services. In this case, the relevant eGovernment systems should be able to provide personalised information based on the profile and needs of the user as well as the legal framework defining the public service. Consider for example the need to provide information about obtaining a new passport. One way to address this is by developing a website containing all relevant legislation. This, however, does not provide personalised information and is difficult in use. An alternative is to provide an interactive website where, e.g. through an online dialogue, the system would understand the exact needs of the users and hence provide them with personalised information e.g. about needed documents, cost and address of nearest relevant authority.

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The main objective of this chapter is to present a flexible and scalable framework of an eGovernment system targeting the informative phase of complex public services. The proposed system exploits semantic web technologies and illustrates their application to E-Business. For this purpose, examples of two real cases in Greece are given. The first is the case of obtaining an operation license for any kind of an enterprise. The second case is finding the social benefits that a citizen is entitled to, based on his/her profile.

BACKGROUND

Several information technologies exist for the creation of web-based E-Business applications. The use of Semantic Web (Berners-Lee, Hendler, & Lassila, 2001) and Semantic Web Services (Fensel D., C. Bussler, & Maedche, 2002) technologies to enable the interoperability of systems and applications is gaining momentum worldwide.

The state-of-the art technology in a web environment is adding semantic meaning to web recourses. Currently these resources are usually only human understandable: the hypertext mark-up language (HTML) only provides information for textual and graphical information intended for human consumption. Semantic Web aims for machine understandable information that can be processed and shared by both computers and humans. Tim Berners-Lee (2001) provides the definition of the Semantic Web as "an extension of the current one [Web], in which information is given well-defined meaning, better enabling computers and people to work in cooperation."

An E-Business information system can be implemented in several different ways. For example a set of business rules could be modeled using simple if – then rules in any programming language. Process modeling using a workflow system is also an option. Relational databases using SQL queries could also be selected for the implementation.

In the case of eGovernment, all above-mentioned technologies has been used in the development of information systems. As already mentioned, in this paper we are focusing on the informative phase of public service provision. The aim of this phase is to provide personalised information to end-users in an easy and understandable way. The use of workflow technologies has been extensively investigated for this purpose. For example, workflow technologies have been used to create a dialogue-based, web system where citizens could be informed on the process and input documents for declaring a property to the cadastral (Tambouris, Kliafas, Kalampokis, & Tarabanis, 2009). For providing personalised services, 30 different laws and ministerial decisions were considered that resulted in identifying 38 different categories and subcategories of rights and 82 different input documents. As a result, an online dialogue having 11 different questions was implemented which result in 240 different routes for any single user.

It should be noted here that the semantic technology is not necessarily a competitor of the above-mentioned technologies since these may apply to different types of applications for different purposes. It is not an easy task to design the relational database or the workflow system to represent a complex scenario. In simpler cases the relational model or if-then rules can be used. But in complicated cases an ontology model provides more flexibility and robustness in design and implementation. The advantage of semantic technology over the above-mentioned technologies lies on the fact of creating machine-readable data capable of modeling complex cases. The same information can be shared not only among humans but also among clever agents in the web. Another major advantage is the fact that information using semantic technologies can be distributed anywhere in the web. Ontologies can be imported, merged