An Ontology based Framework for E-Government Regulatory Requirements Compliance

M. Mahmudul Hasan, Department of Informatics and Telematics, Harokopio University, Athens, Greece
Dimosthenis Anagnostopoulos, Department of Informatics and Telematics, Harokopio University, Athens, Greece
George Kousiouris, Department of Informatics and Telematics, Harokopio University, Athens, Greece
Teta Stamati, Department of Informatics and Telecommunications, University of Athens, Athens, Greece
Peri Loucopoulos, Institute of Digital Innovation and Research, Dublin, Ireland
Mara Nikolaidou, Harokopio University of Athens, Athens, Greece

ABSTRACT

E-Government has gained an enormous amount of attention by researchers and practitioners interested in digitizing the public sector through enacting policies and regulations. Compliance of regulatory requirements from these policies and regulations is an important requirement in e-Government service development projects. However, the concepts of regulatory requirements compliance are still scattered around in developing e-Government services. This article presents an e-Government regulatory requirement compliance (eGRRC) ontology framework that describes the interrelated concepts of regulatory requirements compliance in e-Government service development. The proposed eGRRC ontology is then applied on the recently introduced general data protection regulation (GDPR) for personal data processing across European Union (EU) countries, in order to indicate how the concepts can be mapped to the defined entities. The contribution of this article is on introducing a framework for researchers and practitioners to explore regulatory requirements compliance and their interrelationships in e-Government service development. Furthermore, e-Government legislation can accordingly be modeled using on the eGRRC ontology, that serves as basis for queries to infer knowledge about the source of regulatory requirements, objectives of the regulation, various types of requirements, the services affected, orientation of regulatory rules in requirements, priorities, and amendments of regulations in e-Government service development.

KEYWORDS


INTRODUCTION

Simple, convenient, and effective interaction between the citizens and government agencies in public service has become a common expectation in modern information society. Hence, the e-Government solution brings fundamental changes in the traditional government operation that affects the infrastructure of public service delivery. Among multiple solutions varying in the efficiency and the degree of reliability in information transaction in e-Government systems the blockchain technology
shows promising potential in recent e-Government service development, mainly for validating and displaying document history. It provides a data exchange platform that facilitates interlinked data generation by various government authorities without making any replica and ensure reliable information exchange among different authorities connected to one another. For example, the police constantly require data from the population register while the unemployment insurance fund depends on the information from the health information system (Markusheuski et al., 2017; Rahmadika & Rhee, 2018).

The e-Government projects often face uncertainties and problems in the grey regulation areas or being constrained by existing regulations in adopting new technologies and solutions for e-Government service development. Moreover, new regulations are also growing in public administration to support the emerging digital government (Alpar & Olbrich, 2005; Yoon, 2018). However, how a legislation may or may not affect in the e-Government services is often not easily identifiable due to lack of clear understanding of the regulatory requirements and their compliance in the projects.

The objective of this paper is to introduce an e-Government regulatory requirement compliance (eGRRC) framework that describes the interrelated concepts of regulatory requirements compliance in e-Government service development based on the review of existing works in the e-Government domain in the form of a suitable description schema in knowledge representation. There are several methods that can be used for knowledge representation in various application domain. An XML schema can be used to describe the structure of a legal document that can be machine understandable and automatically processed for meeting legal requirements in manipulation of data, for example, in cloud federation scenarios (Kousiouris et al., 2013; Corrales et al., 2017). However, both XML schemas as well as blockchain approaches, while feasible to be used during runtime of the system, they cannot efficiently capture dependencies between concepts during the design time in order to guide developers, nor leverage inference capabilities based on the concept structure. For the purpose of this study, the OWL ontology is suitable to describe existing concepts from the systematic literature review of related works on existing e-Government ontologies in order to enhance the reusability and extension of descriptions for regulatory requirements compliance in e-Government service development. Ontologies are widely accepted knowledge representation paradigm in several application domains and becoming popular in e-Government domain in knowledge management and representation (Alexopoulos et al., 2007). The e-Government researcher and practitioner can utilize the eGRRC ontology framework to understand the requirements of e-Government service development from a regulatory perspective. Moreover, existing legislations can be implemented in the eGRRC ontology that serves as a basis for various queries about the effects of the legislation in the e-Government services.

The reminder of this paper is as follows. The research methodology is defined and described its strategic operations. Then, the eGRRC ontology elements are presented from existing ontologies and related published works in e-Government domain followed by describing the various interconnected concepts of eGRRC ontology. The eGRRC ontology is then applied on GDPR regulation to indicate how the concepts can be mapped to the defined entities and infer knowledge. Finally, the paper concludes with reflections of the eGRRC ontology development and suggestions for future research.

**METHODOLOGY**

Systematic literature review (SLR) particularly mapping category of SLR suggested by Kitchenham et al. (2010) is used in this study to investigate the concepts of regulatory requirements compliance from existing ontologies and general literature presented in the e-Government domain to describe the eGRRC ontology. Mapping SLR is suitable in this study that provides a conceptual analysis of various existing concepts where the conventional category of SLR process provides only the statistical data analysis of quantitative comparisons of a research question. Figure 1 shows the methodology of the study.
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