# Forward to the Special Issue on Vocabularies, Ontologies and Rules for the Enterprise

Vocabularies, ontologies, and business rules are key components of a model-driven approach to enterprise computing in a networked economy. Such rules do not exist in isolation but serve to support business processes, among a long list of other applications. While many have recognized the importance of vocabularies, ontologies, and business rules in business process modeling and management, there are still many open research challenges to be addressed. These challenges can be approached from different perspectives.

Fundamental research explores ontological foundations, languages and methods for enterprise and business process modeling. It also covers ontological evaluation of enterprise systems and their interoperability, as well as ontological analysis of business process modeling. Applied research looks into enhancing business rule engines and business process management systems with ontologies. Business process modeling research aims to define how process modeling and execution languages, such as Business Process Modeling Notation and Business Process Execution Language, relate to business ontologies and rules. Enterprise integration and collaboration research addresses ontology-based service description technologies for inter-enterprise collaboration. These areas embrace active and important research work that has encouraged this special issue.

This special issue on *Vocabularies, Ontologies and Rules for The Enterprise* was edited with the purpose of depicting the state of the art and practice in this area. We received 36 high-quality submissions from leading researchers in the area and finally accepted six papers for inclusion in this special issue. Each paper was peer-reviewed by expert reviewers and was in some cases reviewed in up to three rounds to ensure that the highest quality standards were met. We believe that this special issue contains some of the leading work in semantics-enabled enterprise engineering and can serve as a foundation point for further advancing the efforts in this area.

The paper by Paulo Sérgio Santos Jr. *et al.* entitled “*An Ontology-Based Analysis and Semantics for Organizational Structure Modeling in the ARIS Method”* performs an in-depth critique of the ARchitecture for integrated Information Systems (ARIS) method; specifically its organization view. Although the ARIS method has been widely used in successful enterprise modeling endeavors, some researchers have encountered problems in implementing it. The authors have used the Unified Foundational Ontology (UFO) in order to systematically analyze the ARIS method and to provide ontological interpretations for the modeling elements of this method. This has allowed them to identify problems with the modeling language and provide insight into possible approaches for resolving issues such as ontological mis-interpretations of the language elements and certain usage problems derived from semantic overload and construct redundancy.

In the paper entitled “*Modeling and Validation of Business Process Families*”, Groner *et al.* propose the idea of incorporating variability in business process modeling in order to generate a problem specific business process. While this approach enhances reusability and rapid business process modeling practices, it would be hard to verify whether the derived business processes are in fact syntactically and behaviorally valid. The authors further propose a Description Logic-based method for validating the derived business processes that is able to reason about both the variability model and business model template and infer whether behavioral and syntactic constraints are satisfied. The authors have reported their experience with variability models of up to 150 features.

The work by Anny Kartika Sariet *et al.,* *An Approach for Sub-ontology Evolution in a Distributed Health Care Enterprise*, focuses on the significant problem of the management of frequent updates to large ontological models. The specific problem domain addressed by this paper is the case of healthcare ontologies such as SNOMED-CT and UMLS. Given the large scope of these ontologies, frequent changes are expected to be applied on them that can in turn have a negative impact on applications and enterprise models that have been already built on this basis. To address this issue, the authors propose the idea of developing sub-ontologies from the large ontology that will be kept consistent at all times. Application will use these sub-ontologies as opposed to the large ontology and hence will not be directly affected by changes. However, in order to propagate changes to sub-ontologies, change identification and propagation processes are proposed in a way that maintains both local and global consistency.

Along the same lines as the previous paper, the work by Ensan and Du, entitled “*A Semantic Metrics Suite for Evaluating Ontologies*” focuses on issues related to maintenance of large ontologies. This paper concentrates on the notion of modular ontologies, which is a systematic way for breaking Description Logic-based ontologies into more manageable and coherent sets of sub-ontologies. While modularization could improve understandability and maintainability, it is important to develop suitable modules for an ontology; otherwise, modularization can lead to overhead in reasoning time and performance. This paper proposes semantic metrics for cohesion and coupling that are based on definitions of relativeness and dependency between ontology symbols. The authors have investigated the correlation between the metrics and reasoning performance, which shows that the proposed metrics can be used as predictors for reasoning performance during the modularization process.

The paper entitled “*Concept maps as the first step in an ontology construction method*” by Starr and Parente de Oliveira focuses on early stage domain model development and specifically addresses the challenge of building enterprise domain ontologies. The authors propose that concept maps can be used as a starting point for information acquisition and can be later used to guide the ontology development process. For instance, the information in a concept map can be used to extract information such as generalizations and mereologic relations that assist in building the domain ontology hierarchy. The major benefits of the proposed approach are that it makes the ontology development process repeatable and provides clear justification for the modeling decisions.

The final paper of this special issue is dedicated to the very subtle symbolic grounding problem. In their paper entitled “*An Approach for Grounding Ontologies in Raw Data using Foundational Ontology*”, Fiorini *et al*. explore the fact that symbolic ontological representations of domain concepts are often separated from real world raw data because of the mediation of the user. The authors suggest that notions in the Unified Foundational Ontology (UFO) can help bridge this gap. This ontological characterization provides better criteria for deciding which domain entities can be grounded in raw data and what is the best approach for grounding them. They report an interesting case study of the proposed work in Geology.

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