An ontologically well-founded framework for modelling Business Organizations, Processes and Services

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Aims and Objectives of the Research

Our primary aim is to create an ontologically well-founded framework for modelling Business Organizations, Processes and Services under a common unifying view. Such a framework will include both a language and a methodology, possibly supported by interactive modelling tools. For the language component, a secondary aim is to explore the computational complexity of syntactic verification and model generation.

Justification for the Research Topic

The gap between ICT technology and business needs is still an active and important area of investigation. From the business perspective, people still need proper corporate governance tools suitable to capture in a unified framework the process view, the organization view, and the value-flow view. However, at our knowledge, there is no ontologically well-founded framework that unifies these aspects.

In general, in order to model each of these aspects, enterprises use different languages that do not share a common ontological foundation. For this reason, the integration between artefacts specified in these languages cannot be fully automated, usually being costly and time-consuming.

Research Questions

1. Previous experience shows that modelling languages that implement very general, upper-level ontological constraints in their own syntax (*e.g.*, OntoUML [1]) have a number of practical advantages. An issue we want to explore is how this approach can be extended to more specific, application-oriented modelling needs, by incorporating further middle-level constraints, reflecting a shared ontology of organizations, processes, and services.

2. Would such a language be useful/practical? In particular, considering issues like modelling constructs adequacy and computational costs of syntax verification and model generation, we need to achieve a careful balance between richness of constructs on one hand, and availability of a proper methodology for choosing the right constructs and adopting effective modelling patterns on the other hand. What would be the optimal balance between language and methodology?

3. What would be the computational complexity (and practical cost) of (i) performing syntactic verification, (ii) suggesting modelling patterns and (iii) generating models on such a language? Would these problems be decidable/tractable?

Research Methodology

In order to achieve our base goals, we idealized the following tasks:

1. Analyse the state of the art concerning:

    a. Languages and standards for modelling Business Organizations (*e.g.*, UML [2,3], OntoUML [1]), Business Processes (*e.g.*, BPMN [4], YAWL [5], PSL [6], ARIS [7], ORM [8]) and Services;

    b. Foundational ontologies (*e.g.*, DOLCE [9,10], UFO [1]);

    c. Middle-level ontologies: Process ontologies [6,11], Enterprise ontologies [12,13] and Services and value flow ontologies [14,15];

2. Isolate a suitable middle-level ontology, possibly merging and/or extending existent ontologies;

3. Find a set of relevant patterns in Business Organizations, Business Processes and Services and analyse them in order to propose a number of good modelling choices that can improve the overall quality of the models;

4. Create a language such that:

    a. The abstract syntax is a suitable subset of the set of ontological categories;

    b. The syntactic constraints are derived from ontological constraints;

5. Define suitable methodological guidelines founded on ontological distinctions. The methodology will possibly suggest a set of annotation patterns and/or stereotypes for existent languages and standards;

6. Define modelling patterns that can guide modellers in making suitable ontological choices;

7. Perform empirical studies on the usability of (i) the methodology and (ii) the language.

Concerning the secondary goals:

1. Analyse the computational complexity (and practical costs) of (i) performing syntactic verification, (ii) suggesting modelling patterns and (iii) generating models;

2. Implement interactive modelling tools capable of (i) performing syntactic verification, (ii) suggesting these modelling patterns when suitable, (iii) generating models;

3. Perform empirical studies on the usability of the tools.

Research Results to Date

We are building a tentative mapping from the foundational ontology DOLCE to UFO in order to define the foundational ontology that will be employed.

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