Collaborative enterprise integrated modelling*

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1 Introduction and Motivations

Enterprise modelling refers to the creation of an (integrated) enterprise model, that is, the structured description of one or more aspects of an enterprise and their mutual relations. Traditionally, enterprise models were focused on the description of process and business domain of an enterprise. Recently, enterprise modelling has been extended to other important assets of an enterprise (e.g., goals, human resources, enterprise structure and roles). Focusing on many different aspects of an enterprise (each one requiring specific modelling skills), and involving different modelling actors, enterprise modelling is truly a collaborative activity carried on under some collaborative protocol.

State-of-the-art methodologies and tools are mainly based on the, so called, waterfall paradigm. This paradigm presents some drawbacks towards an integrated enterprise modelling. First, the collaboration pattern has to stick to rigid interaction protocols which usually go from informal knowledge to formal knowledge. Second, the final formal model is an artefact which is not tightly integrated with the informal specifications that it is supposed to represent. These drawbacks greatly limit a real collaborative modelling between knowledge experts and knowledge engineers. A further limitation of many current methodologies and tools is that they usually deal with a single aspect of an enterprise. Not enough attention is given to the production of a reference meta-model for integrated enterprise models and to methodologies and tools for the support of a uniform integrated enterprise modelling.

Our work aims at supporting collaborative modelling of enterprises in two different ways. First, we propose a new collaborative approach for enterprise modelling, where different actors can actively collaborate in a truly flexible manner to create an integrated enterprise meta-model⁵. Second, we propose a tool based on Semantic MediaWiki to support the development of an integrated enterprise meta-model. Please, see [1] for an extended version of this work, including a detailed related work section.

⋆ Work partially funded under grant 027023. IST work programme of the European Community.
⁵ This model was devised to support the development of work integrated learning applications and integrates a domain specific model, a process model and a competency model.
2 The Collaborative Enterprise Modelling Approach

The approach for enterprise modelling that we propose is inspired by recent Web 2.0 collaborative solutions, in particular wikis. In our approach all the different actors involved in modelling asynchronously collaborate towards the construction of an integrated enterprise model by inserting knowledge (either formal or informal), by transforming knowledge (from informal to formal) and by revising knowledge. A knowledge expert can enter knowledge - in form of informal knowledge - into the models, or provide feedback on the current models. The result of this input is stored in the “informal part” of the model. The system semi-automatically translates part of the informal model into a formal specification and vice-versa. Asynchronously, the knowledge engineer can refine the “formal part” of the model by inserting new statements and adding new constraints.

The result of the activity carried on under the collaborative enterprise modelling approach is the construction of structure in which the different aspects of an enterprise are integrated in a unique model and in which a tight connection between the informal and formal part is retained. This integrated model is therefore an artefact that can be used both by humans and machines. The structure of this integrated model (hereafter called meta-model) is depicted in Figure 1. The main characteristic of this meta-model is the fact that it is structured in two components: the first component is the formal representation of the domain, the processes, and the competencies of an enterprise. These three aspects are described in three formal models, namely the domain model, the process model, and the competency model, which are bounded in a coherent integrated model. The second component is the informal knowledge. This component, which is usually left out of modelling schemata, contains an informal description of the formal model and it is tightly connected and intermixed with the elements of the formal model. We have decided to include also this part in the enterprise model as it has a crucial role in allowing human access and understanding of the integrated model. In our work, we have decide to represent the formal part of the meta-model as an OWL ontology, and the informal part as pages in a Semantic MediaWiki [2].

Fig. 1. The integrated enterprise model.
To support the collaborative enterprise modelling here proposed we developed MoKi, the Modelling WiKi, a tool based on Semantic MediaWiki. The main idea is to associate a wiki page to each (simple or complex) element of the formal model in a way that this page contains an informal but structured description of the element itself. The typical page contains (i) an informal description of the element considered, described mainly in natural language (images or drawings can be used as well), and (ii) a structured part, where the element is described by means of triplets of the form \((subject, relation, object)\), with the element itself playing the role of the subject. This natural language based, but also structured, description provides an ideal bridge between formal and informal representation of knowledge.

To support the development of the integrated enterprise model, MoKi aims to offer a bunch of features to support the automatic alignment between the informal and formal knowledge coexisting in the models, and to ease the modelling of the three components (domain-specific model, process model, and competencies model) in a synchronised manner.

Here we briefly describe the features currently available in MoKi. The users can easily edit the content of wiki page by means of forms. Via the model import functionality some preexisting formal models can be imported in the wiki. Also list of elements organized according to predefined semantic structures (e.g. a taxonomy or a mereology) can be easily imported. MoKi includes a term extraction functionality which allows to add to the models terms (or clusters of terms) extracted from digital documents. Browsing/editing of the models is supported by means of a graphical interface. The informal models described in MoKi can be easily exported in the appropriate formal language thanks to the model export functionality.

4 Conclusions

In this paper we have presented a (i) new collaborative approach for enterprise modelling, and (ii) a wiki-based tool to support it (MoKi). The approach and the tool have been successfully applied within EU-project APOSDLE (www.aposdle.org) to develop five integrated enterprise models in the following domains: environmental consultancy, electromagnetism simulation, innovation and knowledge management, requirements engineering, and statistical data analysis.

References