Comprehensive Tool Support for Enterprise Modeling and Evaluation

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ABSTRACT

Enterprise modelling and evaluating subsequently created models is manifold. Enterprise modelling means capturing an organization’s business processes, its organizational structure, its corporate strategy, or its supporting information systems in graphical conceptual models. Evaluating these models means assuring their structural and semantic quality as well as their user group adequacy. Enterprise modelling and model evaluation requires comprehensive tool support. Recently, a number of modelling tools have been proposed each addressing particular aspects of enterprise modelling or model evaluation. For example, meta-modelling tools allow for defining new and altering existing modelling languages. Meta-modelling tools are thus well suited for enterprise modelling as this requires a large number of different modelling languages that may need to be adapted to the particular enterprise. In contrast, some modelling tools provide mechanisms to structurally or semantically evaluate models of a predefined language. However, comprehensive tool support for enterprise modelling and model evaluation is missing up to now. With this paper, the authors aim at closing this research gap by proposing a tool combining meta-modelling capabilities with features to structurally and semantically evaluate models as well as to manage model perspectives. The tool thus covers the entire model lifecycle from defining a problem-suitable modelling language, creating models, configuring them for different user groups, and evaluating them in terms of structure and semantics.

Keywords: Enterprise Modelling, Meta-Modelling, Model Analysis, Model Configuration

INTRODUCTION

Enterprise modelling refers to the development of conceptual models describing a company’s business processes (Nüttgens, 1997), documenting and communicating information systems requirements (Sommerville and Sawyer, 1997), specifying database schemas (Chen, 1976), or capturing the corporate strategy of an enterprise (Frank, 2002). Developing such conceptual
models requires a wide variety of different modelling languages (Koschmider, Hornung, and Oberweis, 2011). These languages specify a set of object and relationship types as well as corresponding diagrammatic representations, thus facilitating the development of graphical conceptual models (Draheim et al., 2010).

Enterprise modelling allows for describing various aspects of an organisation on different levels of abstraction (Frank, 2002). The resulting models need to be evaluated in order to identify inefficiencies and derive improvement potential for the real world aspects they describe (Gustas and Gustiené, 2003). Evaluating a conceptual model means analysing its structural and semantic properties as well as determining its fit to a given domain. Evaluating conceptual models cannot solely be based on objective criteria (Frank, 1998). It is rather a subjective process that requires a discussion among modellers and model users. However, enterprise modelling and effective model evaluation presupposes comprehensive tool support for those aspects of the model evaluation process that can be automated (Recker, 2012). Implementing corresponding tools that allow for both enterprise modelling and a rigorous evaluation of models, however, proves challenging for a number of reasons:

- First, enterprise modelling requires a great number of different modelling languages (e.g., process modelling languages, data modelling languages, etc.). A given modelling language may prove inadequate for the particular enterprise in which it is used (Frank, 2011). In this case, the language either has to be extended meaning that further element types have to be defined or a completely new, more domain-specific modelling language needs to be developed (Strecker, Heise, and Frank, 2011). Modelling tools therefore should incorporate mechanisms to flexibly and easily extend existing modelling languages or create new domain-specific ones.
- Second, different model users may have different information needs that have to be captured in conceptual models. This results in complex models that may very well include several hundred or even thousands of elements (La Rosa et al., 2011b). This fact impedes the usability of a model, thus precluding its rigorous evaluation. Therefore, a mechanism is desirable allowing for an effective perspective management (La Rosa et al., 2011a). A model perspective captures only those aspects of a model that a particular user is interested in.
- Third, analysing the structural properties of a conceptual model is an integral part of its evaluation (Pfeiffer and Niehaves, 2005). A structural analysis requires, amongst others, detecting particular subgraphs within the overall model graph. Such a subgraph may represent a syntax error (Mendling, 2007), a compliance violation (Awad, Smirnov, and Weske, 2009), a process weakness (Becker et al., 2010), or a model fragment that frequently occurs within a collection of models (Dijkman, Dumas, and Garcia-Banuelos, 2009). Identifying such sections equals the problem of graph pattern matching. We argue that a modelling tool capable of structural model evaluation should provide corresponding pattern matching functionality.
- Fourth, analysing the semantic properties of a conceptual model is an integral part of its evaluation (Fellmann et al., 2011). An important prerequisite for a semantic model evaluation is that its labels are terminologically unambiguous. Studies show that conceptual models created by different modellers can vary significantly with respect to terms and phrases used to label model elements (Hadar and Soffer, 2006). This fact complicates a meaningful model evaluation, as different users may understand various terms differently. Modelling tools should consequently provide a mechanism to terminologically standardize element labels.

Current (non-meta-)modelling tools seem to address these challenges insufficiently (cf. Section 3). Such tools usually offer a limited...
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