



Chapter III

Evaluating Conceptual Coherence in Multi-Modeling Techniques

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ABSTRACT

Meta-modeling is a well-known approach for capturing modeling methods and techniques. A meta-model can serve as a basis for quantitative evaluation of methods and techniques. By means of a number of formal metrics based on the meta-model, a quantitative evaluation of methods and techniques becomes possible. Existing meta-modeling languages and measurement schemes do not allow the explicit modeling of so-called multi-modeling techniques. Multi-modeling techniques are techniques that offer a coherent set of aspect modeling techniques to model different aspects of a certain phenomenon. As a consequence, existing approaches lack metrics to quantitatively assess aspects that are particular to multi-modeling techniques. In this chapter, a modeling language for modeling multi-modeling techniques is proposed as well as metrics for evaluating the coherent set of aspect modeling techniques that constitute the multi-modeling technique.

INTRODUCTION

Modeling techniques aid the construction of conceptual models of phenomena in reality, by offering languages to express knowledge about the phenomenon that is modeled and procedures for capturing this knowledge. Within the field of information systems engineering and business process modeling, there exist numerous modeling techniques of which the IDEF and Yourdon (Yourdon et al., 1979) are classic examples and the Unified Modeling Language (OMG, 2002), Event Driven Process Chains (Scheer et al., 1999), and Petri-nets-based approaches (Aalst et al., 2002) are considered state of the art.

Most of these techniques are so-called *multi-modeling techniques* (Bajaj, 2000) — they offer a coherent set of *aspect modeling techniques* to capture different aspects of the modeled phenomenon: IDEF offers, e.g., IDEF0, IDEF1, and IDEF2 modeling techniques; the Yourdon approach offers data flow and entity-relationship modeling techniques; and the UML offers a total of nine modeling techniques to capture, e.g., Use Cases, Classes, Sequences, and Collaborations.

The aspect modeling techniques in a multi-modeling technique are somehow connected, forming a coherent multi-modeling technique. They are connected to each other because they share the same modeling concepts and/or knowledge to model different aspects of the same phenomenon. Too much coherency in a multi-modeling technique is undesirable, since when the knowledge that can be expressed by applying the aspect modeling techniques overlaps, the resulting aspect models will become difficult to keep consistent.

Meta-modeling is an approach that is widely used for capturing and evaluating modeling techniques. However, as argued by Rossi et al. (1996), most meta-modeling languages do not allow explicit modeling of the coherent set of aspect modeling techniques in a multi-modeling technique. An example is the OPPR language, discussed in Rossi et al. (1996).

In this chapter, I will propose a modeling language that is capable of explicitly modeling the coherent set of aspect modeling techniques in a multi-modeling technique, as well as a formal foundation of this language. The proposed language is called the C-Me language (*Capture Models for Evaluation*). This description language can best be compared with fact-oriented approaches such as NIAM and ORM (Halpin, 2001), but differing because of: (1) a more compact notation, (2) absence of constraint modeling, and (3) an extension for modeling coherence between aspect modeling techniques. Based on this foundation, a number of metrics for measuring the coherence between aspect modeling techniques is proposed. The usefulness of the proposed framework will be illustrated by applying it to evaluate the UML for Business Modeling that was proposed by Eriksson et al. (2000).

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