Metamodeling: Some Application Areas in Information Systems

Dimitris Karagiannis, Hans-Georg Fill, Peter Höfferer, and Martin Nemetz

University of Vienna, Department of Knowledge Engineering, Brünner Straße 72,
A-1210 Vienna, Austria
{dk,hg,ph,mn}@dke.univie.ac.at
http://www.dke.univie.ac.at

Abstract. Metamodeling is a powerful concept in the area of information systems that can be applied to solve a variety of tasks. The goal of the paper at hand is to provide an insight into these application areas. In order to do so first the basic thoughts behind metamodeling are introduced. Then it will be shown that there are applications in the context of the creation and composition of metamodels that have to be supported by “cross-sectional” aspects like visualization and simulation. Finally, we will describe some of these applications in more detail.

Keywords: Metamodeling, intellectual capital management, semantic interoperability, visualization.

1 Introduction

This paper is going to provide insight into some application areas of metamodelling. The best way to realize such an intention is to start with a discussion of the meaning of the main term. When considering the term “metamodelling” we see that it consists of two parts: “meta” and “modeling”. Let’s begin with a deeper look into the second one.

“Modeling” basically denotes the process of creating models. Models in computer science, in turn, are seen as “a representation of either reality or vision” ([30], p. 187). Therefore, they describe certain subjects under consideration either as they are or as they should be. Of course, this representation is not able to include all aspects of the original but can only focus on some of them (property of reduction) and a model is always intended for a specific purpose (property of pragmatics) [26].

Models can be classified according to the language that is used for their creation. Non-linguistic or iconic models use signs and symbols that have an apparent similarity to the concepts of the real world that are being modeled. Linguistic models on the other hand use basic primitives (i.e. signs, characters, numbers, ...) that do not have any apparent relationship with the part of reality being modeled except the one that is defined in an explicit way [29]. Nearly all models
used in computer science are of the latter linguistic type\textsuperscript{1} on which we restrain ourselves hereafter.

Now, we can turn to the second part of “metamodelling” which is the “meta”-prefix that comes from Greek and according to Webster’s Dictionary literally means either “between”, “with”, “after”, or “akin to”. One of the actual usages of this prefix defines a kind of “beyond”-relationship. This also fits the term “meta-model” as a metamodel can be seen beyond other models in that it is a “a model of models” [20]. It is important to understand this statement in a correct way where the following example might help. Consider the famous Mona Lisa who shall be our subject under consideration now. The painting by Leonardo Da Vinci that can be found in the Louvre in Paris is an iconic model of Mona Lisa. Now consider a poster reproduction of this painting that can be bought in the museum shop. This poster again is a model, or to be more precise a model of a model (the painting). But it is not a model of models (please notice the plural). For something to be a metamodel it has to describe a set of other models which has to be understood as providing the means for the creation of other models. Put in other words this implies that “A metamodel is a model of a modelling language” [4].

A graphical representation similar to figure 1 is typically used to explain this in more detail while introducing the so-called metamodelling hierarchy. On the top layer there is the subject under consideration that shall be modeled. This is done with the help of a modeling language. For instance, when creating a database for let’s say the management of student data we can use the Entity-Relationship modeling technique (ERM, [2]) in order to abstract reality. The available modeling primitives of the modeling language (in the case of ERM:

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\textsuperscript{1}Linguistic models can be further distinguished in being realized with textual or graphical/diagrammatic languages [12].