

Why do we need a Meta-Level for the CRM?

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In a talk "Supporting Documentation at the Categorical Level", Martin Doerr suggested to extend the CRM by a meta-level. In this presentation, I will take up the arguments in favor of such a meta-level and comment on it from a primarily methodological perspective. We will discuss several expressive means w.r.t. to their appropriateness and add a few considerations from the viewpoint of computational logic, i.e. decidability of the inference problem, completeness and soundness. Starting with observations from professional practice, I will ask what can be reconstructed in a methodologically well-understood way and whether there is a way to deal with the "informal" remains (including what seems to be still questionable in my understanding). What we want to achieve is not just a transformation of unreflected professional practice in common language form to a (semi-) formal representation, but keeping in mind the ultimate goal of a computationally tractable formal representation which enables certain kinds of inferences as classification, although we have to be aware that we will never be able to reach this goal fully. Starting with a few remarks about the term "meta", we will look at the construction of classes by abstraction, at concept expressions and analytical reasoning with concepts. In this way, we can provide a solution to the ambiguities of quantification which usually arise with class diagrams in object-oriented programming. Furthermore, with this approach, strict cases of categorical documentation can be handled in a simple and elegant way. In particular, we will argue in favor of a methodologically clean separation of types and tokens which are often mixed up in professional documentation practice. Talking about typicality, generics, and prototypes introduces in fact a new level of representation, and we will discuss several proposals to deal with it: relevant quantification, universally indeterminate objects, prototypes and stereotypes, modal conditionals, situation semantics, and default reasoning. Taking up Martin Doerr's examples, we will have a closer look on the framework of non-monotonic reasoning. In particular, default rules seem to offer a promising solution, but at the cost of a transition from statements to rules, i.e. a real transition to the logical meta-level, which in turn leads to problems on the computational side. But for "normal" defaults, Answer Set Programming, an efficient model generation technique based on stable models, provides a tractable inference scheme. We conclude with

addressing the question whether we really need modalities or even a transition to a modal logic and add few remarks on statistical reasoning (which is nevertheless beyond the scope of this presentation).