

Chapter 3

Ontological Evaluation of Scheer's Reference Model for Production Planning and Control Systems

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ABSTRACT

Within the information systems field, reference models have been known for many years. A reference model is a conceptual framework and may be used as a blueprint for information systems development. Despite the relevance of reference model quality, little research has been undertaken on their systematical analysis and evaluation. In this chapter, we evaluate Scheer's reference model for production planning and control systems from an ontological point of view. The evaluation is based on the Bunge-Wand-Weber ontology. Several ontological anomalies are found in Scheer's reference model. The obtained knowledge is useful for selecting, applying, and extending the reference model.

INTRODUCTION

Within the information systems field, information modeling is a vital instrument for developing information systems (Mertins & Bernus, 1998; Mišić & Zhao, 2000; Scheer & Nüttgens, 2000;

Schütte, 1998). However, the modeling process is often resource-consuming and faulty. As a way to overcome these failures and to improve and to accelerate the development of enterprise-specific models, the concept of reference modeling has been introduced (Mertins & Bernus, 1998; Mišić & Zhao, 2000; Scheer & Nüttgens, 2000; Schütte, 1998).

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In the meantime, several reference models have been developed (Fettke & Loos, 2003a). One of the most fundamental issues in conceptual modeling is to define what “quality” means or, to put it more specific, what constitutes good modeling practice. Since some time past, various authors use the Bunge-Wand-Weber model (BWW model, cf. Section II, and the BWW meta-model in (Evermann & Wand, 2001a, 2001b; Opdahl & Henderson-Sellers, 2002; Shanks, Tansley, & Weber, 2003; Wand, Storey, & Weber, 1999)) for evaluating modeling *grammars* (Fettke, 2006; Fettke & Loos, 2003c). In this paper, we apply the BWW model to evaluate a reference model as a special kind of a modeling *script*.

The objective of this piece of research is to evaluate Scheer's reference model for production planning and control systems (so-called Y-CIM model, cf. Section II). Therefore, we propose a method that is based on the BWW model. This study follows the approach of (Wand & Weber, 1993) in at first identifying ontological deficiencies of the grammar (Wand & Weber, 2002, p. 364) which is used to represent a reference model and in identifying afterwards ontological anomalies of the reference model itself.

Our reasoning is not based on empirical observations. Instead we use theoretic arguments and critical discussions to come to our findings. We neither argue that empirical research strategies are useless in the area of conceptual modeling nor that our approach is superior to other approaches. However, we believe our approach can give some interesting insights into Scheer's reference model. From our point of view, this kind of research strategy is adequate in the domain of conceptual modeling because reference models are information products that are primarily produced and interpreted by humans — and not by machines. Nevertheless, we prefer formal investigation methods because they allow precise and clear examinations. Other than with the Design Science approach, we do not develop an information systems artefact.

The paper unfolds as follows: After this introduction we describe the theoretical background of this study. Section III introduces a method for the ontological evaluation of reference models. In Section IV, the proposed method is used to evaluate Scheer's reference model from an ontological point of view. The results of the ontological evaluation are critically discussed in Section V. Finally, Section VI draws some conclusions and points to some further research directions.

THEORETICAL BACKGROUND

Terminology

There is a great deal of terminological confusion in the modeling literature. For example, the term “model” is often used for different purposes. To avoid confusion, we use the following definitions:

A *grammar* “provides a set of constructs and rules that show how to combine the constructs to model real-world domains” (Wand & Weber, 2002, p. 364). In the remainder of this paper, we solely refer to analysis grammars, e.g. the Entity-Relationship Model (ERM) or the Unified Modeling Language (UML). And while a *modeling method* “provides procedures by which a grammar can be used” (Wand & Weber, 2002, p. 364), *scripts* are the product of the modeling process. “Each script is a statement in the language generated by the grammar” (Kruse, Hars, Heib, & Scheer, 1993, pp. 48f.). A script is a representation of a real-world domain using a particular grammar.

A *reference model* is a script representing a class of domains. It is a conceptual framework which may be used as the blueprint for information systems development (Fettke & Loos, 2003a). Reference models are also called universal models, generic models, or model patterns. To use reference models, they must be adapted to the requirements of a specific enterprise. We refer to such adapted models as application models. An overview of reference models is given by (J.-P. W. G. D. Van

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