Chapter III
Meta-Modeling for Situational Analysis and Design Methods

Inge van de Weerd
Utrecht University, The Netherlands

Sjaak Brinkkemper
Utrecht University, The Netherlands

ABSTRACT

This chapter introduces an assembly-based method engineering approach for constructing situational analysis and design methods. The approach is supported by a meta-modeling technique, based on UML activity and class diagrams. Both the method engineering approach and meta-modeling technique will be explained and illustrated by case studies. The first case study describes the use of the meta-modeling technique in the analysis of method evolution. The next case study describes the use of situational method engineering, supported by the proposed meta-modeling technique, in method construction. With this research, the authors hope to provide researchers in the information system development domain with a useful approach for analyzing, constructing, and adapting methods.

INTRODUCTION

Many methods for developing information systems (IS) exist. The complexity of the projects in which they are used varies, as well as the situational factors that influence these projects. Over the years, more methods will be developed, as the technology will continue to diversify and new ISs are being developed. However, often methods are too general and not fitted to the project at hand. A solution to this problem is situational method engineering to construct optimized methods for every systems analysis and design situation, by reusing parts, the so-called method fragments, of existing established methods.

In this chapter, an overview of current method engineering research is given. A general approach on situational method engineering is described, as well as a meta-modeling technique, which supports the process of situational method engineering. The technique will be illustrated in two examples. Finally, we describe our future research and conclusions.

BACKGROUND

No IS development method exists that is best in all situations. Therefore, to improve the effectiveness of a method, it should be engineered to the situation at hand, by taking into account the uniqueness of a project situation (Kumar & Welke, 1992). This is defined as "*method engineering*: the engineering discipline to design, construct and adapt methods, techniques and tools for the development of information systems" (Brinkkemper, 1996).

A special type of method engineering is situational method engineering. The term *situational method* is defined as "an information systems development method tuned to the situation of the project at hand" (Harmsen, Brinkkemper, & Oei, 1994). Situational method engineering is often used in combination with route maps, high-level method scenario's, which can be used to tune the method into situational methods (Van Slooten & Hodes, 1996). Different routes are used to represent the different situations: new IS development, COTS (commercial of the shelf) tool selection, re-engineering, and so forth.

Several situational method engineering approaches have been described in literature, by, for example, Brinkkemper (1996); Saeki (2003); Ralyté, Deneckère, and Rolland (2003); and Weerd, Brinkkemper, Souer, and Versendaal (2006). To execute the method engineering process, methods need to be described for which several modeling techniques have been proposed. Saeki (2003), for example, proposed the use of a meta-modeling technique, based on UML activity diagrams and class diagrams, for the purpose of attaching semantic information to artifacts and for measuring their quality using this information. In Rolland, Prakash, and Benjamin (1999) and Ralyté et al. (2003), a strategic process meta-model called Map is used to represent process models.

In all research on situational method engineering, several steps are followed in the process to develop a situational method. By comparing the different approaches, we could distinguish the following generic steps in a situational method engineering approach (Weerd et al., 2006):

- Analyze project situation and identify needs;
- Select candidate methods that meet one or more aspects of the identified needs;
- Analyze candidate methods and store relevant method fragments in a method base; and
- Select useful method fragments and assemble them in a situational method by using route map configuration to obtain situational methods.

The third and fourth steps are supported by a meta-modeling technique, especially developed for method engineering purposes. This technique, in which a so-called *process-deliverable diagram* (PDD) is built, is used in analyzing, storing, selecting, and assembling the method fragments. The meta-modeling technique is adopted from Saeki (2003), who proposed the use of a meta-modeling technique for the purpose of attaching semantic information to the artifacts and for measuring their quality using this information. In this research, the technique is used to reveal the relations between activities (the process of the method) and concepts (the deliverables produced in the process). We will elaborate on this in the next section.

PROCESS-DELIVERABLE DIAGRAMS

This section describes the technique used for modeling activities and artifacts of a certain process. As we are modeling methods and not the artifacts of an IS, this type of modeling is called meta-modeling. We express the meta-models of method in PDDs, which consist of two integrated diagrams. The process view on the left-hand side of the diagram is based on a UML activity diagram (OMG, 2003) and the deliverable view on the right-hand side of the diagram is based on a UML class diagram (OMG,