6 Variability Modeling and Product Derivation in E-Business Process Families

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6.1 Introduction

Nowadays, process oriented software systems, like many business information systems, don’t exist only in one single version, which covers the whole target market. Instead, many different variants of the system exist, which are specialized according to diverging customer needs. Until now, the corresponding customization has to be done manually, being a time-consuming and error-prone task. However, the ability to rapidly and cost-effectively develop and deploy customer tailored system variants is crucial to the competitiveness of companies developing business software. In order to cope with these challenges, techniques for the efficient production of similar software systems have been developed. These techniques, known as software product family engineering [1], have already been applied successfully in several enterprises [2]. However, up to now the investigation of product family engineering techniques for families of process oriented software, in short process family engineering, has been widely neglected. In this chapter we therefore present our findings in the area of process family architectures for e-business systems, described as variant-rich process models in the Business Process Modeling Notation (BPMN) [3] as well as product derivation issues regarding the particularities in process family engineering.

This chapter is structured as follows: In section 6.2 we give a brief introduction to some basic concepts and describe in section 6.3 their application to an e-business process family. Section 6.4 introduces an approach for variability modeling in e-business process family architectures and for the automation and consistency maintenance during the derivation of process family members. In section 6.5 we
illustrate our findings based on an exemplary process family of e-business shops. In section 6.6 we summarize the contents of this chapter.

6.2 Preliminaries

In this section we give a brief introduction to Process Family Engineering and Process Family Architectures.

6.2.1 Process Family Engineering

Product family engineering is a paradigm to develop software applications using a set of software subsystems and interfaces that form a common structure based on which derivative products tailored to individual customer needs can be efficiently developed [4]. Another important aspect is that within a software product family reuse isn’t restricted to the reuse of implementation artifacts but is expanded to any development artifact (like e.g. requirement or design models).

Product family engineering is characterized by a so called dual lifecycle [5] as indicated in figure 1 [6]. In order to emphasize that our work focuses on the development of process-oriented software, we use the term process family engineering instead of product family engineering and process family infrastructure instead of product family infrastructure. However, the basic development process is the same for product family engineering as for process family engineering. In the first section of the process family development process (called process family engineering) generic development artifacts (called the process family infrastructure) are developed based on which process family members are derived efficiently in the corresponding phase within the second section (called application engineering) of the process family engineering process. During the derivation of process family members variation points contained in the generic artifacts of the process family infrastructure have to be configured according to the customer requirements. Thereby, dependencies between the variation points within the same as well as between different development artifacts have to be regarded. In our approach, we use an additional model, called variability management model, to control the dependencies between the variabilities within the process family. A specialty of process family engineering in contrast to product family engineering is that the process family architecture can act as a requirements artifact in addition to its role as design artifact. So, the customer can select a product not only based on the typical requirements artifact, like e.g. a feature model, but also based on the process family architecture. This has to be taken into consideration during product derivation.

6.2.2 Process Family Architectures

During the design of a process family a process family architecture (PFA) is developed based on the process family requirements. The PFA acts as reference