Chapter 10
Quality–Driven Database System Development

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ABSTRACT

The chapter presents a quality-driven, MDA-based approach for database system development. It consists of four parts. The first part gives a short presentation of quality models and basic MDA concepts. The second one discusses the specific relationships between software development and quality assessment processes. The third part presents the Q-MDA framework which combines the aforementioned processes. The framework is next tailored for database systems design. In particular the authors discuss the relationship between MDA models and data models. The last part contains an example of the framework application. The example shows how the specification and evaluation of the quality of database models can influence the process of database system development.

INTRODUCTION

As information systems become more complex and widespread, their quality becomes a more and more important concern in their development. Therefore, requirements for software product quality should be treated in the same way as functional requirements, however it involves ad-

ditional effort and extra costs. To ensure product quality two basic approaches can be considered: the first based on the evaluation of the quality of the final product, and the second based on the evaluation of the quality of the process by which the product is developed. The quality of software development process influences positively on the quality of a software product.

Many modern approaches to software development are based on modeling paradigm and they implement the notions from Model Driven Architecture (MDA). Developers are encouraged to build a sequence of models in which the following is a refined or transformed version of the previous one. In such model-driven development approaches, the requirements to the models at the different levels of abstraction are clearly identified and specified. MDA focuses on functionality. It means that developers during building a model concentrate on the specification of its functionality, and next on the transformation that preserves functionality into a subsequent model. MDA is a very promising approach, however the quality aspect is not explicitly considered by it.

This chapter presents a quality-driven framework for model-based software development. The framework integrates two complementary processes. The first – based on the MDA approach (Miller & Mukerji, 2003) – is used for development purposes while the second – based on the quality specification and evaluation process defined by International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) in ISO/IEC 9126 and ISO/IEC 14598 series of standards – is used for the verification and validation of the output artifacts from the former one. For this reason we call it the Quality-Driven MDA framework (Q-MDA). We are convinced that the integration of both the aforementioned processes is necessary to gain high quality software product.

The framework can be refined for specific purposes. We present its adaptation to quality-driven database system development. The adaptation forms a systematic approach to data modeling at different levels of abstraction and evaluation of their quality that adheres to MDA and ISO standards.

The chapter is organized as followed. The background part contains the basic notions relating to the MDA approach and to quality specification and evaluation models. Next, we give a brief outline of the Q-MDA framework, and next a more detailed description of using the framework for database system development is presented and illustrated by a simple example. The chapter is summarized by conclusions and an outline of future research within the Q-MDA approach.

BACKGROUND

As a software system is a kind of a product which is developed in a production process, therefore its quality may be considered in two perspectives: the product quality and the development process quality. The perspectives are strongly interrelated, for example, in shipbuilding industry, which is a more matured discipline compared to software engineering; the controlled quality over the design and building process is necessary to guarantee the quality of a ship – the final product. In software engineering, the quality of software development process also influences positively on the quality of a software product but does not guarantee the expected quality of the product. The software development process may be considered as a sequence of activities that deliver different artifacts. At the beginning of the process, software requirements are defined (usually on the basis of the business model). At the end a final software product is delivered. Other activities deliver intermediate artifacts. The quality of the intermediate artifacts influence the quality of the final software product. The chapter abstracts from the quality of the software development process, and concentrates on the quality of the software product and its relationship to the quality of the intermediate artifacts.

How to get high quality software becomes a more and more important question today. The question concerns two subquestions: how to develop software and how to control quality within the development process.

Furthermore, we consider MDA as a modern approach to the development of software systems.

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