Chapter 26
Quality-Driven Database System Development Within MDA Approach

Iwona Dubielewicz
Wrocław University of Technology, Poland

Bogumila Hnatkowska
Wrocław University of Technology, Poland

Zbigniew Huzar
Wrocław University of Technology, Poland

Lech Tuzinkiewicz
Wrocław University of Technology, Poland

ABSTRACT

The chapter presents an extended version of a quality-driven, MDA-based approach for database system development. The extension considers the relationship between successive models in the MDA approach. In particular, it gives rise to the introduction of domain ontology as a model preceding the CIM model as well as allows assessment of the extent to which the successive model is conformant with the preceding model. The chapter 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 and the proposal of a new quality characteristic (model conformance) with some measures for assessing the quality of a specific model in the context of other models. The last part contains an example of the framework application limited to the proposed quality model extension.

INTRODUCTION

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 additional effort and extra

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

Many modern approaches to software development are based on modeling paradigm and follow the Model Driven Architecture (MDA) approach. 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 specification of its functionality, and next on transformation that preserves functionality into a subsequent model. MDA is a very promising approach, however 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 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 25000 series of standards – is used for verification and validation of the output artifacts from the former one. In the paper we present the Extended Q-MDA which refines the Q-MDA framework presented in (Dubielewicz, Hnatkowska, Huzar, & Tuzinkiewicz, 2011). Motivation for the enhancement is to enable software developers more complete quality assessment of MDA models, i.e. an assessment of a given MDA model in the context of other model. Moreover, we propose for the assessment purposes of CIM model to use a domain ontology describing the same reality as the CIM does. We are convinced that such extension is useful and allows to gain high quality software product.

Similarly to the previous framework the new one can be refined for specific purposes. We present its adaptation to quality-driven database system development but this presentation is limited to the extension part only. The adaptation forms a systematic approach to data modeling at different level of abstraction and evaluation of their quality that adheres to MDA and ISO standards.

The chapter is organized as follows. The background part contains basic notions relating to MDA approach and to quality specification and evaluation models. Next, we give a brief outline of Extended Q-MDA framework, and then more detailed description of using the framework for database system development is presented and illustrated by a simple example which is however restricted to consideration on CIM and PIM data models only. The chapter is summarized by conclusions and an outline of future research within the Extended 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 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 a quality of a software product but does