Chapter 18
Domain Modeling Approaches in IS Engineering

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ABSTRACT

In information systems engineering there is a long history of development and application of different domain modeling approaches, methods and techniques. The chapter surveys and analyzes enterprise models, systems development artifacts, enterprise architectures, enterprise modeling tools, and information systems change management issues from the point of view of information systems engineering. The purpose of this work is to share experience from information systems engineering with model driven architecture community and to reveal strong and weak sides of domain modeling approaches and tools used in information systems engineering which, in turn, would help to see where further research and development efforts are needed in order to achieve maximum value from systems development efforts in the area of information systems engineering and model driven architecture. The chapter focuses on methods used in information systems engineering and, according to its purpose, does not consider in detail domain modeling approaches that are well known to model driven development/engineering/architecture community.

INTRODUCTION

The purpose of this chapter is to provide an overview of domain modeling approaches and techniques used in information systems (IS) engineering. IS engineering is an area where different types of domain models were used as a basis for software development long before the name of model driven approach and model driven architecture was coined (MDA, 2009; Miller & Mukerji, 2003). IS engineering views not only software, but also requirements and domain models, as systemic artifacts that can be traced, analyzed, and reused in different systems development tasks. Examination of historical evolvement, level of completeness, complexity,

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and usability of these models, methods, and tools may provide a better understanding of tendencies, problems, and constraints in model driven domain analysis and software development. The paper mainly focuses on the requirements phase of IS engineering, where domain modeling to some extent is similar to development of CIM (Computation Independent Model) in MDA (Model Driven Architecture) (Miller & Mukerji, 2003; Lankhorst, M., 2005; Gherbi et al., 2009; Kheraff et al., 2008).

Background section concerns different approaches of domain modeling used for requirements identification. In requirements engineering (as a part of IS engineering) at least some means for systemic elicitation and amalgamation of requirements are usually applied. One can see that emphasis on particular issues in domain analysis has been changed by putting IS users or business systems in the main focus at different levels of abstraction and using different representation frameworks. The section will show the spectrum of approaches and the way how requirements knowledge is integrated in some of the representative methods. It consists of two subsections. The first one discusses domain modeling in IS engineering; the second one briefly considers domain modeling in model driven software development.

Models developed during requirements engineering phase are essential IS engineering artifacts. The scope and use of these artifacts depend on the approach of IS development. For instance, agile and enterprise modeling driven methods differ considerably in their creation and use of systems development artifacts (Kirikova, 2004; Stirna & Kirikova, 2008). Dependence of domain modeling approaches on systems development methods is analyzed in section "Domain modeling artifacts in different IS development approaches".

While in Background section the main emphasis is on diversity of requirements engineering approaches in terms of domain analysis methods applied for requirements identification, in section "Role of enterprise architectures in domain modeling and analysis" the domain analysis frameworks are analyzed taking Enterprise Architectures into the main focus. This section also includes analysis of multilevel systems representations in general. Section "Role of tool support in use of domain modeling approaches" briefly discusses issues of tool support for domain analysis. Here the gap between knowledge utilized in enterprise modeling tools and tools supporting UML (UML, 2009) is analyzed. The discussion is continued in section "Domain models and change management" where systems change management issues are considered. The paper ends by brief description of future work and conclusions.

BACKGROUND

This section discusses domain modeling from the viewpoint of two related but still bit alienated communities, namely IS engineering and software engineering. The main difference is in points of emphasis of approaches. According to the purpose of the chapter the section focuses on basic approaches in the IS engineering (subsection "Domain modeling in IS engineering"). Nevertheless, several approaches known in software engineering and, in particular in domain model driven approaches, are discussed as a related work in subsection "Domain modeling in model driven software engineering".

Domain Modeling in IS Engineering

In IS engineering the main purpose of domain modeling is identification of system of requirements for the IS to be built. In fact, IS engineering implies that requirements are engineered not just transferred from the heads of end-users via programmers to software. There are numerous approaches of requirements engineering that have been reported in different scientific conferences and on consulting company web pages (see, e.g.,