Knowledge in Information System Development

Boris Bučko*
Department of Information Networks
Faculty of Management Science and Informatics
University of Žilina
Univerzitná 8215/1, 010 26 Žilina
boris.bucko@uniza.sk

Abstract

The development of information systems (IS) scored several developmental stages that are characterized both in terms of their use as well as access to the solution.

These stages influenced creation of different types of information systems for various applications. But what in the development of the IS is still missing is a clear connection to user requirements.

This paper considers using ontology in some aspects of model driven development.

Categories and Subject Descriptors

H.4 [**Information Systems Applications**]: Miscellaneous; D.2.8 [**Software Engineering**]: Miscellaneous

Keywords

information system, model driven architecture, ontology, CIM, PIM

1. Introduction

The process of development of information systems is a permanent task of software architects and developers who are trying to develop innovative solutions. On the other hand, there are the users, whose demands are a challenge to exploring new approaches of IS development. Therefore, in the recent period information system developers interested in a flexible and easy to maintain information systems that can meet the requirements of users in the shortest possible time.

Most systems not fail for technical reasons, but because they do not address the real needs of customers. Lack of focus is placed on the analytical stage represented in MDA (Model Driven Architecture) in the CIM (Computational Independent Model) level only postpones real problems for later in the implementation and maintenance of systems.

2. Model driven architecture

Model Driven Architecture - MDA is based on creation of models and transformations between these models. MDA specifies four levels of abstraction:

1. Computation Independent Model - CIM
2. Platform Independent Model - PIM
3. Platform Specific Model - PSM
4. Implementation Model - IM

Levels of abstraction mentioned above are fundamental paradigm of MDA. The first three levels are graphical models, the last level is made of program code.

3. Current results in the research field

Organizations seek for information technology to support specific processes. Creation of support for these specific processes often cannot be obtained by configuring existing software package. In such situations, the system and its components necessary to create tailored directly towards the requirements of users. Specific processes needs a logical and efficient interconnection of data, information and knowledge through the implementation of knowledge management.

Creating models for the development of IS in general ensures:

- systemic approach
- complexity
- transparency
- methods of visual expression of IS requirements
- methods of detecting life-cycle of the IS development

then for the implementation of knowledge management is the CIM the model of the highest abstraction in the development of knowledge systems.

Modeling CIM level within MDA followed by transformation into PIM level provides answers to problematic issues relevant to information systems that are as follows:

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1. How to capture the functionality of creating information system?
2. How to transfer functional criteria directly to system design?
3. How to ensure adaptive change functionality criteria?

Existing solutions for modeling CIM level in BPMN language and subsequent transformation into a level PIM, above, in many cases, are not suitable for the implementation of knowledge management because they cannot adequately capture the semantics of the activities performed. Sometimes the various misinterpretations arise from BPMN diagrams, if the of the meaning of swimming circuits with a pool (if the file is regarded as a number of pools lanes on the other hand) is inverted are as referred to [1]. But this has more to do with the actual modeled as-capture semantics, which is a result of incorrect modeling or judgment consequently misinterpreted.

BPMN modeling language (Business Process Modeling Notation) in the model driven architecture is not primarily designed for modeling knowledge, and semantic accuracy of created models cannot be verified. Another problem is to preserve the semantics in the transformation between levels. Knowledge modeling support in the development of knowledge IS could provide ontologies. Therefore, in further solutions we focus on using of ontologies for the development of knowledge-based information systems.

By comparing ODS (Ontology Driven Systems) characteristics and OES (Enhanced Ontology Systems) found that ontology is more beneficial in ontologically driven systems. In their development ontology is used from an early stage and by ontology is designed more complex issue than the OES solution, in which is ontology only a complement to conventional IS development process or complement existing IS. Even though the creation of ODS architecture requires much more work than OES ontological proposal, properly designed architectural framework for the ODS development can eliminate errors caused by different types of modeling languages in a variety of architectural views and transformations between them.

The CIM level in the model driven architecture expresses implementation model of IS environment. In the modern information society, regardless of the type implementation environment, CIM level reflects models of information and data, their efficient processing, switching and transforming to knowledge. All the activities of all companies and institutions are based on the collection of large amounts of information that are stored as data as well as the necessary knowledge for the operation, management and innovation. This fact thus pushes the ontology to the forefront in the field of IS development, especially knowledge-intensive IS.

This makes use of ontology as a new approach in the IS development our research challenge.

4. Ontology in model driven architecture

Information systems for the promotion of knowledge management are intended to promote knowledge techniques for decision support, learning and action.

The aim of knowledge-based systems is broad and solve various problems of their implementation - the overall process of development, alignment of the requirements and needs of users, applications, knowledge of different methods, integration with conventional technologies, software development tools, decision-making mechanisms, user interaction, acquisition and representation of knowledge, language and programming environment, technology implementation expertise, system architecture etc.

Ontology is the basis of ontology and knowledge (if built on ontologies) engineering.

Layer CIM - Computer Independent Model MDA reflects the description of the business architecture layer and PIM - Platform Independent Model description of the software architecture. In contrast, the ontology data captures information and knowledge. Certainly there are a number of views with which could be layers CIM / PIM linked to ontology. The CIM and PIM layers could be represented by ontologies which could simplify the process of transformation or the transformation could be removed completely.

Ontologies are often part of knowledge-based systems, but the creation of knowledge-based systems from the architectural point of view is not a trivial matter.

5. Conclusion

Requirement to work with the information, data and knowledge at the same time creates new challenges, the resolution of which may move the development of information systems to the next level.

The use of ontology in the development of the IS is closely linked to the ontology and knowledge engineering. Ontological engineering in some aspects is not very different from the process of developing information systems, characteristic analysis, creation of system models and the creation of logical and physical design of the system. Proposal of interlacing a model driven architecture and ontology is the first benefit.

With constant increase of data, information and knowledge, the demand for knowledge-based systems and knowledge management increases. Nevertheless, so far there was not given more attention to a procedure for the formation of knowledge-based systems.

Information systems for the promotion of knowledge management are intended to promote knowledge techniques for decision support, learning and action. The issue of knowledge-based systems is broad and solve various problems of their implementation - the overall process of development, alignment of the requirements and needs of users, applications, knowledge of different methods, integration with conventional technologies, software development tools, decision-making mechanisms, user interaction, acquisition and representation of knowledge, language and programming environment, technology implementation expertise.

From the level perspective of model-driven architecture knowledge management as a method belongs to CIM level, which in the architectural context of the development IS represents Business architecture. CIM level modeling in BPMN language and adhere to the strict rules of trans-

formations between models CIM and PIM for modeling principles of knowledge management cannot always express the semantics of data.

If we consider modeling according to the principles of knowledge management it is the modeling information, data and knowledge. Information and knowledge belongs in the architectural context to business architecture, data are belongs to software architecture that in the MDA represents PIM level.

Using ontology for representation of MDA level could bring new approach to the development of information systems.

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