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## Methods of Automated Model Transformations in Information System Analysis

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### Abstract

The main goal of this PhD project is to develop methods that will automate processing of transformation from one model to another model in information system analysis. More generally bridge the gap between business models and information analytics models. These methods will be implemented and proved. Transformation method will have impact to the developed tool OpenCASE. Methods will be based on existing theory, but will be processed in not known form. Method approach will be based on Model-Driven Architecture. In this paper will be described transformation approaches model-to-model and model-to-text. This will be compared to already known transformation methods.

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*Keywords:* Transformation Method; Model Driven Architecture; Ontological Analysis; BORM Method; Tool Extension

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### 1. Introduction

This project is based on the idea to bridge the gap between the two worlds: The world of business, which is focused on processes and understanding the economics, and the world of informatics, which today contains many modern tools and techniques for software development.

The modeling of Information Systems (IS) during the analysis phase is a crucial part of the IS development life-

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cycle. In the analytic phase, processes are tracked and modeled [3].

Modeling based on Model-Driven Architecture has a lot advantages for example metamodel mapping to model [11] and strong background of OMG [1]. The Model-Driven Architecture (MDA) [6] is an initiative by the Object Management Group (OMG) [1] to define an approach to software development based on modeling and automated mapping of models to implementations. The basic MDA pattern involves defining a platform-independent model (PIM) and its automated mapping to one or more platform-specific models (PSMs) [12].

This paper contains clearly formulation of the research question in this section 1 in subsection 1.2. Identifying a significant problem in the field of research in subsection 1.1. Outlines the current status of the problem domain and related solutions 2. Describes the research methodology that is applied or planned in section 3. Presents clearly any preliminary ideas, the proposed approach and the results achieved so far and outlines the contributions of the applicants work to the problem domain in section 4. Highlights contributions uniqueness in section 5.

### *1.1. Goal*

My research idea is to develop a method of transformation that will cover the gap between business modeling and software modeling.

The objective of this PhD research project is a methodological framework to support an engineering approach to the development of IS (Information Systems) and more specifically model transformation in the analysis and design phases of IS development. The outputs will be verified using the prototype of a tool, which will perform this transformation.

### *1.2. Research Questions*

Methods of transformation that will connect over gap between business modeling and software modeling. We can use techniques from graph theory and automata theory (FSM - finite state machine) to connect over gap between business modeling and software modeling. If we have model based on FSM we can use it for simulation and transformation to another model. This graph-based approach or FSM-based approach is objective to connect business modeling and software modeling.

- Explain how to transform business models like BPMN, BORM [5] or UML state, activity diagram to FSM based model.
- Explain how to transform business models like BORM to UML models like activity or state diagram and backwards.

## **2. Problem Background**

Modeling and model transformations are parts of the analysis phase of the IS development. Business Process Model Notation (BPMN) – [9] and also Business Object Relation Modeling (BORM) [3, 5], are an inseparable parts of the IS development analysis phase. This approach is applied for all platforms (desktop, mobile and web applications). Nowadays, tools that support and perform transformations are requested, for example in [8]. The importance of transformation tools is explained in [10].

The Ontology-Centered Modeling [15] generally means to deal with terms and their relations. A more thorough introduction to ontologies and their relation to conceptual modeling and the BORM methodology may be found in our original paper [14]. Generally there are two main categories model to model and model to code, in case can be code subset of model and we can merge these two categories into one category model to model. Classification categories of model transformation approaches are [12]:

- direct manipulation
- relational
- graph-transformation-based
- structure driven
- hybrid

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