

# Conformance Analysis of Organizational Models: A New Enterprise Modeling Framework using Algebraic Graph Transformation

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## ABSTRACT

*Organizational models play a key role in today's enterprise modeling. They usually show up as partial models produced in a distributed and non-synchronized fashion by people with different conceptual understandings. For this reason, there is a major need to organize partial organizational models within a suitable modeling framework, and, moreover, to check their mutual conformance. This builds the basis to integrate the partial organizational models later on into one holistic model of the organization and for model checking certain security, risk, and compliance constraints. In order to attain this goal, the authors present two mutually aligned contributions. The first one is a new enterprise modeling framework—the EM-Cube. The second one is a new approach for checking conformance of models based on the suggested formal modeling technique associated with the proposed framework. They evaluate the potential solution against concrete requirements derived from a real-world scenario coming out of the finance industry.*

*Keywords:* Computer Science, Conformance Analysis, Enterprise Modeling Framework, Information Systems, Partial Models

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## INTRODUCTION

At Credit Suisse we discovered that today's enterprise modeling is facing several challenges concerning the sound integration of heterogeneous and incomplete models that are often developed and maintained in a distributed and decentralized way. For this reason, this paper focuses on how (organizational) models should be organized in an enterprise modeling framework

given these hard side constraints. In particular, given a decentralized organization, the existing partial models need to be kept mutually aligned and consistent to make it possible to integrate them in a sound way later on. In order to do that, we review the real-world situation at Credit Suisse as well as the (scientific) literature with regards to enterprise modeling and conformance checks to come up with requirements based on a qualitative analysis for a potential solution.

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From a practical point of view we focus on the *toolability* of a potential solution. Here, hard side constraints like the implementability need to be taken into account. In addition to that, we expect a potential solution to live in a product eco-system.

From a theoretical point of view we focus on the *soundness* of a potential solution. Here, hard side constraints are formal properties like correctness and completeness concerning the used modeling, integration and analysis techniques. Further, we expect a potential solution to be applied in the context of other methods or best practices.

Therefore, the research question consists of two parts. Firstly, we need to understand what kind of modeling framework can support the organization of partial models, which is at the same time compatible with the real-world setting of a big and decentralized organization like an international bank. Secondly, we need to find a way to check consistency issues between partial models using implementable formal methods that work for any set of valid input models, such that the implemented tools are usable by the people in the field.

As a consequence, this paper presents two contributions that are mutually aligned. The first one is a new enterprise modeling framework, the EM-Cube, that supports the organization of local knowledge of an organization and that is at the same time compatible with requirements from a big and decentralized organization. The second one is an implementable approach that helps to analyze the conformance of partial models of an organizational model using formal techniques of algebraic graph transformation that come with formal guarantees like correctness, completeness, termination and efficiency as well as usability.

In detail, the paper is organized as follows: We first present as problem statement our findings from the real-world scenario at Credit Suisse as well as from the (scientific) literature, which is evaluated with regards to enterprise modeling and conformance analysis. Based on these findings, we present requirements derived from the real-world scenario

and the related work that we use to ground a new enterprise modeling framework and its corresponding modeling technique. In a next step, this framework, the EM-Cube, is introduced and evaluated. Afterwards, an approach for conformance analysis of models based on the suggested modeling technique is developed and evaluated. Finally, we demonstrate the applicability of our approach by the help of a concrete example that is likewise evaluated and finish with some conclusions as well as potential future work. For further technical details see our online report (Brandt & Hermann, 2012).

## PROBLEM STATEMENT

### The Credit Suisse Scenario

The Credit Suisse scenario serves to motivate our potential solution and it provides the empirical source for real-world requirements that are used for evaluation later on. In detail, we will reflect how organizational models that are part of the set of the overall enterprise models at Credit Suisse are produced, organized, and managed (Fox & Grüninger, 1998).

In the given case, a bank like Credit Suisse has a business and IT branch that are expected to operate in an aligned but independent way. In this context, the purpose of the used IT technology is to support financial business processes. In order to achieve this goal, the IT branch focuses on setting up an appropriate IT architecture (Jonkers, Lankhorst, Buuren, Bonsangue, & Torre, 2004). However, there are different views on the IT at Credit Suisse. One view is about the way a software infrastructure is generated. This is done by the help of a model driven engineering (Stahl & Völter, 2006) (Model Driven Engineering, MDE) process. Another view is about the resulting IT architecture, its management and development. In order to develop and manage the IT architecture, the IT branch of Credit Suisse selected TOGAF (Raynard, 2008) (The Open Architecture Framework) as the most suitable best practice from their point of view. Both views are related towards each other. An illustration is presented in Figure 1.

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