Chapter 71
Understanding and Assessing Quality of Models and Modeling Languages

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ABSTRACT

An important challenge for organizational activity is to effectively represent and transfer knowledge. One reason why humans have excelled as a species is our ability to create common stories and represent, reuse, and transfer this as knowledge across time and space. Whereas in most areas of human conduct one-dimensional natural language texts are the main way of expressing and sharing knowledge, the authors see the need for and use of two and many-dimensional forms of knowledge representational to be on the rise. This will also enable users to capture contextual dependencies between roles, tasks, information elements, and the views required for performing work without having to go through traditional systems developers to have enhanced support for their work. The importance on supporting judgment on the quality of these models will thus increase along with the usefulness of frameworks for quality of models and modeling languages such as SEQUAL.

INTRODUCTION

An important challenge for organizational activity is to effectively represent and transfer *knowledge*. One reason why humans have excelled as species is our ability to create common stories and represent, reuse and transfer this as knowledge across time and space. Whereas in most areas of human conduct, one-dimensional natural language texts are the main way of expressing and sharing knowledge, we see the need for and use of two and many-dimensional forms of knowledge representational to be on the rise. A form of representation which plays an increasingly important role in information systems and enterprise development is *conceptual models* (Krogstie, Opdahl, & Brinkkemper, 2007), which are diagrams expressed in some (semi-) formal visual language (e.g. nodes interconnected with edges), describing some area of interest. In (Krogstie, 2007), the following vision was stated: “Over time the use

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of modelling will become an established way of expressing knowledge in all fields of human conduct. Everyone (not only expert 'modelers') is involved in the process of developing and activating models made in adapted modelling language." Examples of models could be organization charts, strategy and goal breakdown structures, business process models, or models of the information to be contained in a database. The *quality* of a conceptual model will strongly affect decisions based on the model, and can therefore be of vital importance to the stakeholders.

According to general model theory (Stachowiak, 1973) there are three common characteristics of models: *Representation, Simplification* and *Pragmatic orientation.*

- **Representation:** Models represents something else than the model itself.
- **Simplification:** Models possess a reductive trait in that they represent only a subset of attributes of the phenomenon being modelled.
- **Pragmatic Orientation:** Models have a substitutive function in that they substitute a certain phenomenon as being conceptualized by a certain subject in a given temporal space with a certain *intention* or operation in mind.

Thus a model is not just a representation of something else; it is a conscious construction to achieve a certain goal beyond the making of the model itself. Whereas modeling techniques traditionally have been used to create intermediate artifacts in systems analysis and design, modern modeling methodologies support a more active role for the models. For instance in Business Process Management (BPM) (Havey, 2005), Model Driven Architecture (MDA) and Model-driven Software Engineering (MDSE) (Brambilla, Cabot & Wimmer, 2012), Domain specific modeling (DSM) (Kelly & Tolvanen, 2008), Enterprise Architecture (EA) (Lankhorst, 2005), Enterprise modeling (EM) (Sandkuhl, Stirna, Persson & Wißotzki, 2014), Interactive Models (Krogstie & Jørgensen, 2004) and Active Knowledge Modelling (AKM) (Lillehagen & Krogstie, 2002; Lillehagen & Krogstie, 2008), the models are used directly as part of the information system of the organization. At the same time, similar modeling techniques are also used for sense-making and communication, model simulation, quality assurance, and requirements specification in connection to more traditional forms of information systems and enterprise development (Krogstie, Dalberg & Jensen, 2008).

Since modeling techniques are used in such a large variety of tasks with different goals, it is hard to assess whether a model is sufficiently *good* to achieve the goals. To provide guidance in this process, the latest version of *SEQUAL,* a framework for understanding quality of models and modeling languages, will be presented in this chapter.

BACKGROUND

Since the early 90ties, many researchers have worked on quality of models. Work on SEQUAL can be traced back to at least 1993 (Lindland, 1993). Sindre and Lindland in particular collaborated on the next step (Lindland, Sindre & Sølvberg, 1994). Although an elegant framework which was easily applicable for understanding important aspects of quality of models, several other works pointed to the need for extending the framework. Important inspirations in this regard was the work on 3 dimensions of requirements engineering (Pohl, 1993), work related to the semiotic ladder presented in early versions of the IFIP 8.1 FRISCO framework (Lindgren, 1990) and work on social construction of 'reality' and models