Chapter 12
Supporting Electronic Collaboration in Conceptual Modeling

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ABSTRACT
The authors study collaborative modeling by analyzing conversations and loud thinking during modeling sessions and the resulting models themselves. They identify the basic activities of the modeling teams on the social, pragmatic, semantic and syntactic levels and derive a schema for the pragmatic level. The authors’ main conclusion is that team-based modeling is largely a negotiation process. Drawing on these results the authors derive an architecture of a system that supports the distributed development of conceptual models.

INTRODUCTION
Descriptive approaches to understanding the modeling process are scarce. Only a few deal with collaborative modeling (see section 2). The others assume a scenario where a single expert modeler creates a formal model of some part of a business (Morris, 1967; Srinivasan & Te’eni, 1995; Willemain, 1994, 1995). These studies identify sets of general heuristics for successful modeling without going down to the level of the concrete steps that are performed in creating models. Their results are hardly applicable to business modeling in general for a number of reasons. Firstly, a business model is rarely developed by an expert alone but rather by a team involving representatives of the respective stakeholders. Secondly, the problem domain of general business modeling is often less well-structured and formal languages are of limited use. Thirdly and last, the goal of providing tool support for collaborative modeling requires the identification of detailed steps.

The objective of this paper is to discover the elementary activities and the structure of the modeling process, i.e. a meta-model of the modeling process. This is done by studying, in a descriptive way, the work performed by small groups of modelers that were assigned the same task: To develop
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business process models for a hospital based on a detailed description of the processes in natural language. This implied collective sense-making of a case text and conceptualizing the group’s understanding of the text in the form of an analysis model. The group members were homogeneous concerning their modeling experience and their roles, i.e. there was no a-priori assignment of a group leader or modeling expert.

We then go on to interpret the results from the empirical study as requirements for a system that supports distributed modeling in groups. We develop an architecture of such a system that is in line with the empirical findings and supports the process that was observed in the study.

BACKGROUND AND ISSUES

Collaborative modelling processes have been studied from a number of different angles, e.g. the structure of the process itself, its organizational environment and techniques to support it. In (Bommel, Hoppenbrouwers, Proper, & Weide, 2006) modelling involves domain experts, modelling mediators and model builders. It is viewed as a form of information gathering dialogue where knowledge is elicited from the domain experts. This view can be challenged because modelling is a social and communicative process where much of the information is created by and through the process rather than gathered from domain experts. We have therefore studied situations where the participants, apart from the facilitator, had no a priori roles but contributed to the modelling session in the way they deemed reasonable.

(Frederiks & Weide, 2006) emphasizes the importance of natural language as the primary medium and identifies two principal activities and associated roles: the domain expert who concretizes an informal model and a system analyst who abstracts a formal model. (S. J. B. A. Hoppenbrouwers, Lindeman, & Proper, 2006) distinguishes between an elicitation and a formalization dialogue and develops a modelling procedure by generalizing existing procedures. They also acknowledge (S. J. B. A. Hoppenbrouwers, Proper, & Weide, 2005) that modelling is not only a knowledge elicitation process but also a knowledge creation and dissemination process. It is viewed as a structured conversation.

We agree that modelling is a conversation but we claim that it is a specific type of conversation, namely a negotiation. This idea is implicitly present in (S. J. B. A. Hoppenbrouwers, et al., 2005) where the dialogue structure contains negotiation elements such as propose and accept. We elaborate this point in the following sections. (S. J. B. A. Hoppenbrouwers, et al., 2005) also advocates the use of controlled language and validation. We consider the latter as problematic as it has often been observed that domain experts falsely agree with a model not being fully aware of all its implications or making assumptions that others are not aware of.

While the approaches discussed so far address the structure of the modelling process itself, (Persson, 2001) and (Araujo & Borges, 2007) look at the environment in which this process is embedded. They study the influence of situational factors on modelling. Their aim is to create an environment that facilitates and supports participative modelling in enterprise or software engineering, respectively.

Another type of work that is related to ours is that around brainstorming methods that can be considered as methods for the creation of rudimentary models in an unstructured problem area (see e.g. (Belton, Ackermann, & Shepherd, 1997; Conklin, Selvin, Buckingham Shum, & Sierhuis, 2003)). Our approach continues this work into the more structured phases of modelling.

Yet another view on collaborative modelling is related to techniques that support the modelling creation. An example of that is studied under the heading “collaborative graph editing” where the focus is on real-time collaboration on the graphical representation of a model (WYSIWIS
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