Closer to the Model – Collaborative Modeling with Wall-Size Interactive Displays

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Abstract

Process modeling has traditionally been approached with a clear distinction between domain and modeling experts – the former providing knowledge, the latter developing processes and visualizing them in graphical models. However, as we deal with socio-technical processes, which need to be adapted by the process participants, this distinction seems rather unreasonable. It causes frustration among process participants, as they may not directly influence process design and modeling, thus reducing their perceived ownership of the process and their commitment to the implementation of the respective process. To overcome this barrier, we propose the use of wall-size interactive displays, which enable users to directly interact with the displayed artifacts and bring them "closer to the model". Furthermore, these also allow simultaneous multi-user collaboration on shared artifacts, and thus potentially also increase modeling efficiency. In this paper, we outline a collaborative modeling approach based on the use of wall-size interactive displays, and discuss its benefits and challenges, both for the modeling process itself and the interaction design for tools supporting it.

1 Introduction

Conceptual models, often in the form of diagrams, have many applications in modern enterprises. Among the most common types are arguably UML or UML-like diagrams which are used by software engineers for systems design (cf. (Cherubini et al. 2007)) and work or business processes (cf. (Barjis 2008, van der Aalst et al. 2003)) used by business analysts. Building the respective models however is a complex task that requires both a thorough understanding of the domain as well as knowledge and practice in process design and visualization through formal modeling. This knowledge is commonly socially distributed, i.e. the input of multiple stakeholders with different backgrounds is required and often users with domain knowledge lack process design and modeling expertise (Rittgen 2010b).

In most modern businesses, knowledge elicitation is limited to interviews, in which process experts and modelers meet with domain experts and ask them about their specific work tasks. Afterwards, this information is translated into visual process descriptions by the process and modeling experts, discussed with the respective process owners and put into execution (van der Aalst et al. 2003).

Research on this topic, however, proposes a facilitated or chauffeured approach, where a co-located group of domain experts works together with modeling experts to build a graphical model of their processes (Herrmann et al. 2004). This approach, known as collaborative modeling (Renger et al. 2008) or group model building (Rouwette et al. 2000), has been widely discussed in literature (cf. e.g. (Renger et al. 2008, Andersen and Richardson 1997, Dean et al. 1995, Rittgen 2009, Rittgen 2008)). It includes at least one session led by a facilitator, who is supported by a scribe – putting down sketches and operating the actual modeling tool – and a number of domain experts by whom the facilitator learns about the domain of interest. Thus, the creation of the graphical model of the process happens in parallel to the respective discussion.

While the overall effect of collaborative modeling was found to be positive (Rouwette et al. 2002), these approaches rarely make it into practice, as they are very time consuming and thus are not perceived to be effective by management. They have also been criticized in recent research (Dean et al. 1994, Dean et al. 2000, Rouwette et al. 2002, Prilla and Nolte 2010, den Hengst and de Vreede 2004) for a number of reasons, most notably a) the substantial bottleneck in the modeling process which is introduced by the facilitator (Dean et al. 1994, Rouwette et al. 2002) and b) the rather passive role of domain experts which may lead to a decreased identification with the results (den Hengst and de Vreede 2004) and thus a reduced buy-in when the solutions are implemented (Rouwette et al. 2002).

Tool support is also a big concern with these facilitated approaches. As Rittgen recently noted, “the majority of the currently existing modeling tools are single-user tools. Strangely, this is even the fact for the ones that explicitly address group modeling” (Rittgen 2010b). This leaves much potential for domain expert involvement unused, as it was found that even users untrained in process modeling are able to capture basic concepts and their relation in a scenario and use semi-formal notations resembling flowcharts to capture them without instruction (Recker et al. 2010). Moreover, the facilitator role may be less important than previously assumed (Rittgen 2010a), and can potentially be replaced by scripts that help participants to follow a more self-organized approach (cf. (de Vreede et al. 2006)).

Eventually, even more advanced tools, e.g. COMA (Rittgen 2008) or the EMS-IDEF0 of (Dean et al. 2000), still rely on standard desktop computers – despite their limitations in displaying large data sets (Yost et al. 2007, Ball and North 2005) and for effective collaborative interaction (Hawkey et al. 2005), or focus rather on the technical implementation of sketch recognition than the actual support of parallel interaction in group modeling processes (Damm et al. 2000, Chen et al. 2008, Grundy and Hosking 2003).

We propose wall-size interactive displays to be ideal candidates for increased domain expert participation and efficient collaborative creation of conceptual models. These devices have already been used in a number of design studio settings (cf. (Khan et al. 2009, Guimbretière et al. 2001)). In particular, because of the seminal work of Jeff Han (Han 2005), it is now also possible to equip them with multi-touch input, the arguably most direct form of human-computer interaction. Thus, beyond mere efficiency gains, we also expect these devices to make models more "tangible".

However, we also identify two major challenges for the use of wall-size interactive displays for collaborative modeling sessions:

1. The high degree of involvement of domain experts requires the modeling process to be more lightweight, including new rules governing collaboration and communication in the shared workspace.

2. The software used for modeling on these devices, needs to be optimized for multi-user multi-touch interaction, in particular with the complex graphical models that are commonly used to visualize process and information models.

In this paper, we will outline how we plan to address these challenges.

2 Approach

In a collaborative modeling process, the model is not only outcome of the process, but also a reference for communication and negotiation during its creation (cf. (Rittgen 2008, Ssebuggwawo et al. 2009)). This fact, together with the challenges identified before, motivates the design of our approach along two major requirements:

- Participants should be directly involved into modeling, i.e. they should be able and asked to actively create and edit the model.

- Model creation should be possible in an iterative fashion, with the option to form expert groups of varying size to deal with specific subjects. The process should also allow negotiation processes between different proposals for partial models.

As indicated before, the central element of our approach is the use of wall-size interactive displays as a shared workspace. These devices commonly span between 3 to 5 meters in width and thus allow a small group of 5 or 6 users to actively interact with them. We prefer vertical displays to horizontal ones, in particular because they provide a common orientation which is essential for a shared understanding of sequential tasks.

According to both our own experiences with collaborative modeling, as well as the findings of (Rouwette et al. 2002), a small number of users (6 to 8) is also most common and most effective for group modeling sessions. For optimal model quality, the group should consist of domain experts from all departments involved in the respective process. Additionally at least one modeling expert will most certainly be required at some point, to support domain experts when difficult situations have to be represented in a modeling notation.

Considering modeling notations, our experiences so far has shown that even users unskilled in modeling are quickly able to express their knowledge with basic concepts in a modeling notation (also cf. (Recker et al. 2010)). These basic concepts include actors, resources and activities and their sequence in a work or business process. However, in most cases, at some point in time, the modeling process will inevitably move beyond these basic concepts. This is where we expect additional benefit from the use of large interactive screens, as they allow iterative refinement of the collected elements into interconnected parts of a formal model. As our experiences so far indicate that large interactive screens possibly lower the threshold for interaction with electronic materials because they resemble classic whiteboards (Döweling and Lewandowski 2010), we foresee a more active role of the participants throughout the whole modeling process. This, as well as the benefits of large displays for collaborative interaction (Hawkey et al. 2005), will potentially also reduce the gap between non-expert and expert modelers.

During the whole process of drafting a model facilitation should be kept to a minimum. This allows domain-experts to perceive the model as their own artifact rather than an artifact of process experts resulting in a feeling of ownership that has a positive influence on later implementation (Andersen and Richardson 1997). The role of the facilitator thus evolves into that of a moderator or guide that only acts when negotiations about different proposals for parts of a model are stuck or participants are struggling with the modeling notation.

Regarding the software that supports this modeling process, we propose that, independent of the modeling notation that is used, the interface design should include suitable interaction techniques specifically designed for multi-user multi-touch interaction with graphical models. In particular, these techniques will need to address physical interference of parallel actions (Hornecker et al. 2008) and conflicts with social protocols (Scott et al. 2004). Furthermore, access to distal elements (Czerwinski et al. 2006) will play an important role.

3 Future Work

For our future work, we will concentrate on two issues:

1. The specific rules governing collaboration and communication in a new lightweight modeling process
2. Interaction techniques that allow easy multi-user multi-touch interaction with graphical models in the shared workspace

With advances in these two questions, we believe our approach, i.e. the use of wall-size interactive displays, will bring domain experts closer to the modeling activity, and thus empower them to take a more active role in the modeling process, with increased direct impact on process design.

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