

# Collaborative Usage and Development of Models: State of the Art, Challenges and Opportunities

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## ABSTRACT

*Collaborative usage and development of models is an interesting challenge for modern organizations. While models play a decisive role in the planning, analytics and execution of many processes, active involvement of people other than modeling experts in creating or using models beyond providing information and being queried about the fit of models to their work is rare in practice. This article creates a context for collaborative model usage and development by describing its benefits, its origins and existing work on the topic. It also presents a taxonomy of existing approaches to support collaborative model usage and development and elaborates on research needs and challenges to be overcome in order to establish it as common practice in organizations. It then builds a bridge to the three contributions in this Special Issue, which describe cutting edge and unique research on these needs and challenges.*

*Keywords: Collaboration, Collaborative Modeling, Interaction, Modeling, Participation*

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## INTRODUCTION

The usage of graphical representations of aspects of an organization (ranging from rather static to rather dynamic such as hierarchies, competences, work and business processes

etc.) or results of creative problem-solving and design meetings (e.g. brainstorming results) becomes increasingly important and valuable for modern organizations and can be considered a common practice in a lot of them. Corresponding graphical representations include process

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models, conceptual models, mind maps and many more. They are used to support multiple tasks such as software development, design and engineering, process optimization and reengineering, knowledge explication and transfer as well as marketing, strategic development and cooperation planning. Regarding this background, it is obvious that such representations are not intended to be used by single users creating them for their own personal needs. Their usage is rather aimed at larger target groups throughout organizations. There they can be used to disseminate knowledge on processes, to support sense making, to create a shared understanding, and especially to design changes in these organizations. This collaborative usage, in turn makes such representations even more useful. Analogically, their development should not be done solely by a group of a few expert individuals but should include multiple people representing multiple perspectives and experiences in order to increase the quality and acceptance of a design or a solution being represented. However, despite the fact that models are common and available artifacts in many organizations and notwithstanding the benefits of using and creating them collaboratively, in practice they are hardly used by or available for non-experts – even if they are created collaboratively they still have little impact on actual work in these processes.

One of the reasons for the lacking usage of and interaction with graphical representations is that there are only a few (research) insights on interactive involvement of people other than modeling experts (stakeholders, domain experts etc.) into the spreading and sustainment of process documentation and usage in organizations. Moreover, up to now we only know little about the interaction of such non-expert users with models, that is, how people can make use of them in practice and interact with them. Interaction in this context includes the contribution to the content of models as well as their usage in people's daily work for purposes such as discussions, knowledge explication and creating a common understanding. Supporting such interaction needs insights on means for increasing the usage and availability

of models after their creation and on suitable tools and modes of interaction with models for people who are not modeling professionals.

Besides the usage and interaction dimensions, there is also a research gap in the collaborative development of graphical representations. Nowadays, as will be elaborated later in this article, this development is usually supported by collocated workshops and similar approaches. In these workshops experts facilitate a process in which experiences and practices are captured, and translated from non-expert articulations into a modeling language. These practices have several risks; first the translation might be based on misunderstanding, second, non-experts might not understand the resulting model, and third, even if the model represents a shared understanding, not having participated in its creation can be used as an argument not to accept the model, especially in the case of 'contested knowledge' or if modeling is related to organizational change, which is frequently the case. Furthermore, despite their applicability and feasibility in many situations this traditional approach creates organizational overhead, restricts user involvement to certain times, requires physical presence instead of dislocated interaction and thus does not fit the need to rapidly adjust processes to changing conditions inside and outside an organization. Fostering the collaborative development of models and including non-expert users into this process needs ways to enable users to contribute actively to creation and maintenance of such models. This may happen co-located or dispersed, synchronous or asynchronous in time or possess different levels of expertise in modeling. This includes enabling users to use modeling languages and contribute directly to a model as well as finding other means such as textual or graphical annotations to enable contributions. Alongside the increasing popularity of graphical models, there is growing interest in their usage and development in the CSCW community. This not only comprises the usage and development of models by modeling experts, but also explicitly takes non-expert modelers into account. The emerging importance of this new field of CSCW research is reflected at

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