

# **Participatory Development of Enterprise Process Models**

# Participatory Development of Enterprise Process Models

Reidar Gjersvik,  
SINTEF Industrial Management ,  
P.O. Box 181  
NO-1325 Lysaker, Norway  
email: [Reidar.Gjersvik@indman.sintef.no](mailto:Reidar.Gjersvik@indman.sintef.no)

John Krogstie, Asbjørn Følstad,  
SINTEF Telecom and Informatics,  
P.O. Box 124 Blindern  
N-0314, Oslo Norway  
email: [{John.Krogstie,Asbjorn.Folstad}@informatics.sintef.no](mailto:{John.Krogstie,Asbjorn.Folstad}@informatics.sintef.no)

**Abstract:** We present in this paper practical experience from using what we term Modeling Conferences, which is a method for participatory construction and development of enterprise process models. Process models are an important way to support communication, coordination and knowledge development within an organization. The method focus on broad participation from all actors in the organization, is grounded in a social constructivist perspective, and has its theoretical basis in the method of search conferences and process modeling. In an engineering consultancy firm, the Modeling Conference method has been used to develop process models for main common work tasks that have been implemented on an Intranet. Independent evaluations show that participation through the Modeling Conferences led to significantly more ownership to the process models, and that the actors have developed new collective knowledge.

**Keywords:** Enterprise Modeling and Business Process Re-engineering, Applications and architecture for Internet/Intranet/Extranet, Knowledge Management

## 1. INTRODUCTION

The Modeling Conference is a method for participatory construction and development of enterprise models. In this, it takes as a starting point the business processes approach to understanding how organizations work. However, while most approaches to the mapping and "re-engineering" of business processes tend to be expert and management focused, the Modeling Conference focuses on participation from all the related parties, and the link between organizational learning and institutionalization through technology.

The focus on participation stems from a constructivist approach to organizations. Organizations are seen to be a continuous construction and reconstruction of an organizational reality as individuals and groups enact their own local reality through everyday practice (Berger & Luckman 1966, Gjersvik, 1993). In order to introduce change in the organizational construction processes, the method of change should reflect the joint participation in the everyday construction processes. Because of this, we have developed a method that has at its core the method of Search Conferences (Emery & Purser, 1996).

In the next section, we will present the background to our approach. Section three present the modeling conference method, whereas section 4 presents the application of the method on a specific case. Section 5 present results from the independent evaluation done of the longer-term results from using the approach. We finish by summarizing our general learnings from applying the approach in many different settings, also pointing to further work

## 2. BACKGROUND

Processes have been a key concept in management and organization for the last decade, especially related to Business Process Reengineering. A process has been defined as "*(...) a structured, measured set of activities designed to produce a specified output for a particular customer or*

*market. It implies a strong emphasis on how work is done within an organization, in contrast to a product focus' emphasis on what." (Davenport, 1993, p.5) And, we might add, in contrast to a functional focus' emphasis on who. The idea has been to identify the key processes in an organization, to simplify and restructure these processes, and to take advantage of the possibilities in modern information technology to automate or support them.*

Process orientation today is, however, most related to organizational thinking in which information technology is important. The methods being used to map and visualize processes are also very similar to the models being used by various information systems and software engineering approaches. This might actually constitute a problem when we want to have broad participation, as the expressiveness of these modeling languages, becomes a barrier when laypersons from many different fields try to use them to map their work processes. When deciding on the suitability of the modeling language to be used, there is in a general a tradeoff between expressiveness and formality of the one hand, and the suitability for the active use of the language and the comprehension of models developed in the language by the participant on the other hand (Krogstie, 2001).

Enterprise modeling is an approach to understanding and visualizing organizations (Fox, 2000; Loucopoulos, 2000). The most common kind of enterprise models are process models, showing the transformation from input to output, and the tools, controls and resources necessary to do this. There are however many other ways to visualize an enterprise, from abstract metaphors to other kinds of explicit modeling languages. Our main aim with the process models is to create a common frame of reference rather than an exact model in which we can put numbers as a basis for process simulations.

In addition to being a common frame of reference, the process models may also be a way to organize the information and tools necessary to perform the various tasks. If the image is digitized (for instance as a web page), the various resources (data, information, tools) may be accessed directly through the process image. This is what we have done in the ICG case presented in section 4.

The core of the Modeling Conference has been adopted from the Search Conference method (Emery & Purser, 1996). The Search Conference is a method for participatory, strategic planning in turbulent and uncertain environments. It has been used in various setting, i.e. community development, organization development, the creation of research initiatives, etc. It has also been done with a number of different designs. The method is based on a few basic ideas including Open systems thinking, active adaptation, genuine democracy and Learning.

### **3. THE MODELLING CONFERENCE METHOD**

The Modeling Conference combines process modeling and search conferences, by doing process modeling in a structured conference environment, promoting broad participation. The argument for participation is primarily based on the social construction view of the organization.

A set of principles lies at the heart of the Modeling Conference. The core of these principles is the ones listed for the Search Conference above, but a few are added due to the special purpose of the Modeling Conference:

- *Open systems thinking:* The unit of development (organization, community, enterprise) is viewed as an open system, interacting with its environment. At the conference, both the whole system itself and the main parts of the environment should be modeled.
- *Active adaptation:* A further consequence of the open systems view, is that the system needs to adapt to the environment. However, in a turbulent environment, passive adaptation is not enough. The organization needs to influence and interact with its environment, to actively create a context in which it can develop. The participants are encouraged to think about both how they might develop the process to adapt to the demands of the customers and the context, but also what demands they might want to put on other processes and actors, including customers.

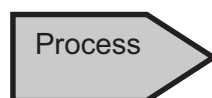
- *Genuine democracy*: As in a search conference, the Modeling Conference is based on the belief that all who are part of the system or process, are experts on how the system/process works as seen from their point of view. All local realities are both valid and important in constructing the common model. Given a suitable structure, the participants are themselves jointly able to analyze and understand the situation, and create suitable action plans.
- *Simplicity*: Modeling languages, methods and concepts should be simple so that it is possible for actors with various local realities to express themselves, and thus make real participation possible (Gjersvik & Hepsø, 1998)
- *Pragmatism*: An important issue in the design of the conference is to find a structure and a mix of methods that will work for all participants, and which is useful in order to produce a satisfactory outcome for the actors in the organization (Greenwood & Levin, 1998).
- *The use of the process model as a communicative and reflective device*: The models are, in addition to being the product of the conference, the main device driving the conference process. The use of large physical process visualizations encourages dialogue among the participants within a common frame of reference. (Gjersvik & Hepsø, 1998)
- *Learning*: The conference should create conditions under which the participants can learn from each other, but also from the way they work at the conference. We emphasize that the learning should not only be about the process model, but also about how to lead a discussion about the process, and about what constitutes knowledge and truth about the process and the organization. We have used the ideas of triple loop learning (Flood and Romm, 1996), stressing that the conference is only one event in a continuous, multi-level learning process.

The Modeling Conference is performed according to the following rules:

- The whole process is performed in one room. All relevant actors in the process should be present or represented in the modeling tasks. In many cases, this also includes outside actors, like users, owners, customers, and governmental and municipal authorities.
- The tasks alternate between group work and plenary work.
- The participants primarily represent themselves, but are jointly responsible for the content of the conference.
- The staff facilitates the work, and is responsible for the conference method (but not the result).
- The modeling language, tools and the overall method must be simple, so that the participants may focus on the content.
- The main outcome of the conference is a process model, which names the key processes, products and roles. Additional results are related to the model.

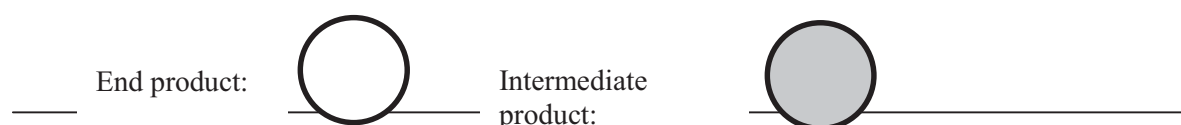
The modeling language used has the following concepts and notation:

*Process*: A series of tasks that produce a specific product. An example is "Draw technical



installations".

*Product*: The result of a process, and in demand by a customer. An example is the product "Drawings of technical installations", which is a product of the process mentioned above. A process may have several products; the process above may for instance also have "Documentation" as a product. We distinguish between *end products* and *intermediate products*.



*Customer:* Someone who demands and uses the product of a process. Often, the customer is another process. For instance, the process "Install technical applications" is a customer of the process "Draw technical installations", and demands the product "Drawings of technical installations".

The conference preferably lasts at least one and a half days. Every group has a large sheet of paper on the wall, on which they work. All symbols are pre-cut, and can be attached to the sheet of paper. Through these simple symbols and physical way of working together one gets great flexibility and intensive learning, but they also limit the form of work. The results of the group work are presented in plenary sessions for discussion and joint construction of models.

The documentation from a Modeling Conference is a report and a process model. The most important outcome of the conference is the ownership that the participants develop through the construction process, which makes the model an important common reference for further more detailed development.

The conference agenda is designed so that the actors of the conference should develop models based on their own local reality before they enter a discussion with actors having (presumably) different local realities. We always start with homogenous groups, where people with the same background develop their process models. After this, the participants are more comfortable with the modeling language and tools, and have more self-confidence about their own point of view. This is especially important in organizations where there is a high risk of some groups of actors (i.e. management, experts) having model power over other participants through having a previously developed model available (Bråten, 1973). We subsequently mix the participants in heterogeneous groups, where the whole modeling starts over again.

The difficult part of the agenda is after the second modeling task, where the models of several groups are to be merged into one. This is done in a plenary session. The conference leader needs to be very attentive to the logic of the different groups, so that he or she is able to combine the elements from different models into one coherent whole. It is important that this plenary session is allowed to take the time it needs to obtain a consensus about the model.

This participatory technique has some commonalities with what is found within the field of Participatory Design (Schuler, 1993), but focuses as we have seen primarily on enterprise modeling, and not the design of information systems as such.

#### **4. CASE STUDY: DEVELOPMENT OF COMMON PROCESS MODEL FOR THE WORK TASKS OF ICG AS A BASIS FOR A NEW INTRANET**

ICG is an engineering consultancy company, with 700 employees. Most of the employees are found in three major cities in Norway (Oslo, Fredrikstad, and Trondheim), but there are also local offices spread out throughout Norway, and 100 employees abroad (in Africa and Eastern Europe). ICG is the result of a merger between three different companies, each a specialist within an engineering field. The merger was effective at the start of 1999.

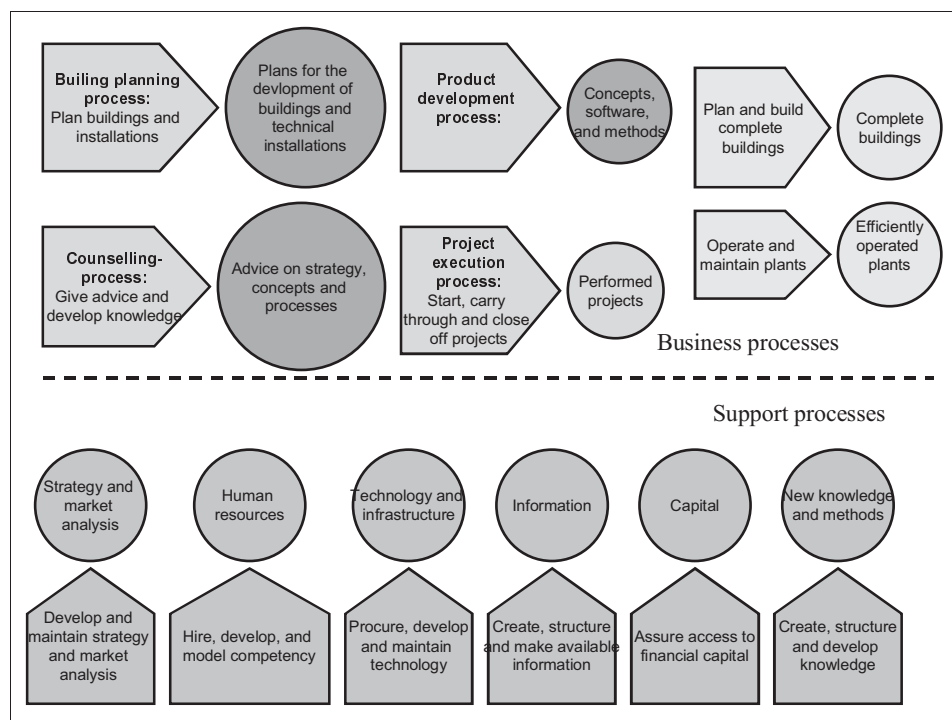
##### **6.3 The Knowledge Infrastructure Project and the preparations for the Modeling Conferences**

In 1999, ICG started the development of their Intranet. As opposed to the existing Intranet (and most other Intranets), the new ICG Intranet was to be a real support and coordination in the actual work the engineers and consultants in ICG do. One of the ambitions in the ICG merger had been to develop synergy effects through new ways of working across engineering disciplines, and an understanding of engineering work processes was seen as instrumental to that.

We decided to use the Modeling Conference as the method to construct the processes. In addition to create a process oriented Intranet, we wanted the project to focus on both organizational and technological change. There had to be participation, both to create ownership and in order to take

seriously that this was a social construction process. We wanted to reflect the continuous reconstruction of local and organizational realities, both in the process construction (the modeling conferences) and through an iterative system development (not to be described in this paper).

The process construction started with a top management meeting, determining the key processes of ICG. This was done through a group discussion, in which the processes were divided into business processes and support processes. The result is shown in Figure 3. The most important outcome from this discussion, was the decision that the process "to initiate, execute and complete a project"<sup>1</sup> (Project Execution) was to be the first process to be constructed and supported by the Intranet. This process was to be followed by the three other business processes currently operational: Engineering, Consulting, and Product Development. Process owners and change agents were appointed for each process.



**Figure 3: ICG key processes.**

#### 6.4 The Modeling Conferences

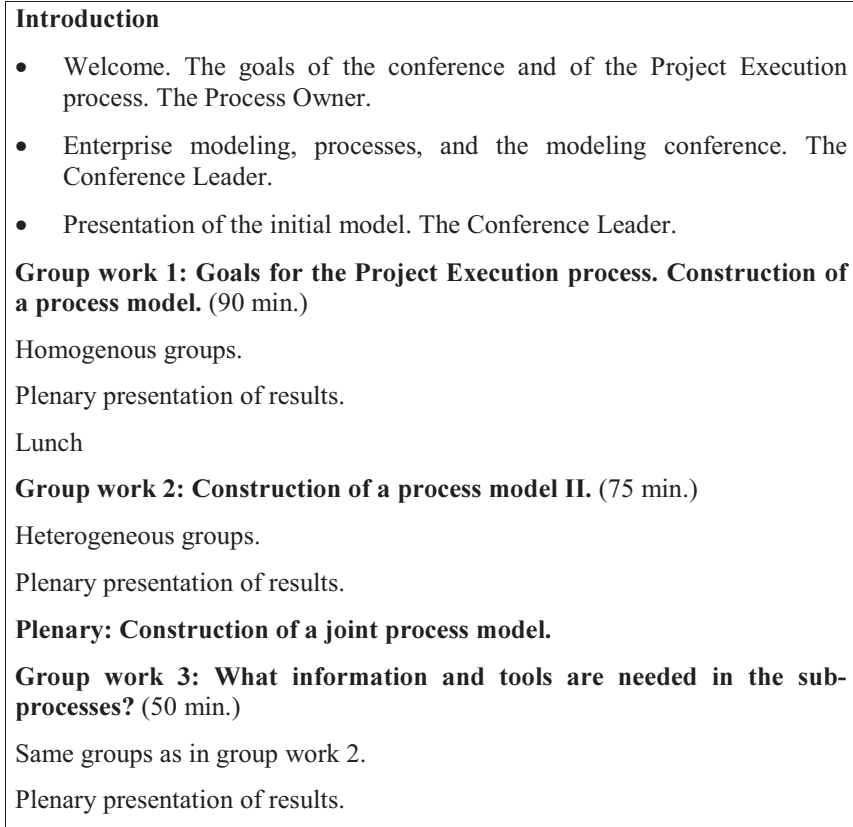
We performed four modeling conferences on the Project Execution process: One in each of the three main cities, where people from engineering tended to dominate, and one in which we focused on people from consulting and from smaller, local offices. We would have preferred to mix people more within each conference, but we had to take into consideration the costs of the conferences (for instance travel expenses.) The participants at each conference were chosen by the process owner and the change agents. We stressed the importance of the project, and that the participants thus should be representative of the whole organization (both experienced and inexperienced, and within various fields.) Although we might have had a better method for this, it worked well in practice, and the conferences (apart from the one in Trondheim<sup>2</sup>) had both a good attendance and a

<sup>1</sup> The correct word is "mission" (Norw.: "oppdrag") rather than "project" (Norw.: "prosjekt"). ICG is being paid to do a mission within a project. The project itself is owned by for instance the building developer. This distinction created a lot of discussion during the construction of the process.

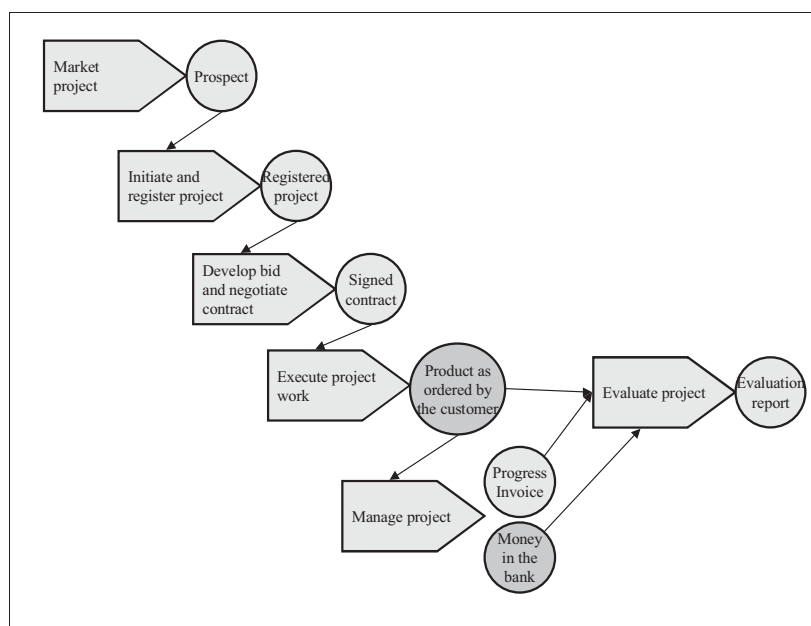
<sup>2</sup> The conference in Trondheim did not have the desired attendance, due to miscommunication and lack of prioritization. Only six people took part, which of course lead to a different kind of conference.



good mix of participants. The process owner and the change agents, assisted by the conference leader, also put together the homogenous groups for the first group work. Mostly, these groups were formed based on skill area.



**Figure 4: Program for the Modeling Conferences in the modeling of the Project Execution process.**



**Figure 5: Initial model for the Project Execution process.**

The program for each conference was pretty similar. The learning we developed from conference to conference, was mostly related to the content of the model and the way we managed the discussions. The program for the conferences is shown in Figure 4.

Due to cost considerations, we had to limit the conferences to one workday. This meant that we could not run the modeling conferences the way we originally intended to, where we let the participants create the first model from scratch. We had to give them a head start; thus we designed an initial model of project execution, where the basic steps were included (Figure 5). In the introduction that the conference leader gave to the participants at the opening, the initial model was used to describe the principles of process modeling. They were also told that their task was to evaluate and validate the model, and preferably to change it completely so that it fitted the way they executed a project.

In the first group work, the participants were also asked to come up with goals for the Project Execution process. The Process Owner gave an introduction to his and ICG's goals at the beginning of the conference, but based on our constructivist view, the goals had to be run through the participative process of the conference before they could acquire meaning for the participants.

The conferences went through the two-step process modeling described earlier. At all conferences, there was great enthusiasm and intense group discussions. It was a challenge to get each group to visualize the whole Project Execution process, as some groups got caught up in detailed discussions about a minor part of the process. Managing this was a difficult balance, because it was important to have good discussions about what words and expressions to be used, and what sequence the sub-processes had. The conference leader had an important role here, as he observed all the group discussions, and intervened if the discussions seemed to be stuck on a non-productive issue.

Another challenge was to keep the participants from thinking in terms of screens and user interfaces. Their task was to construct a good process. Once this was done, it was the job of the process group and the systems development group to find ways to create images of this process that could be used on the Intranet.

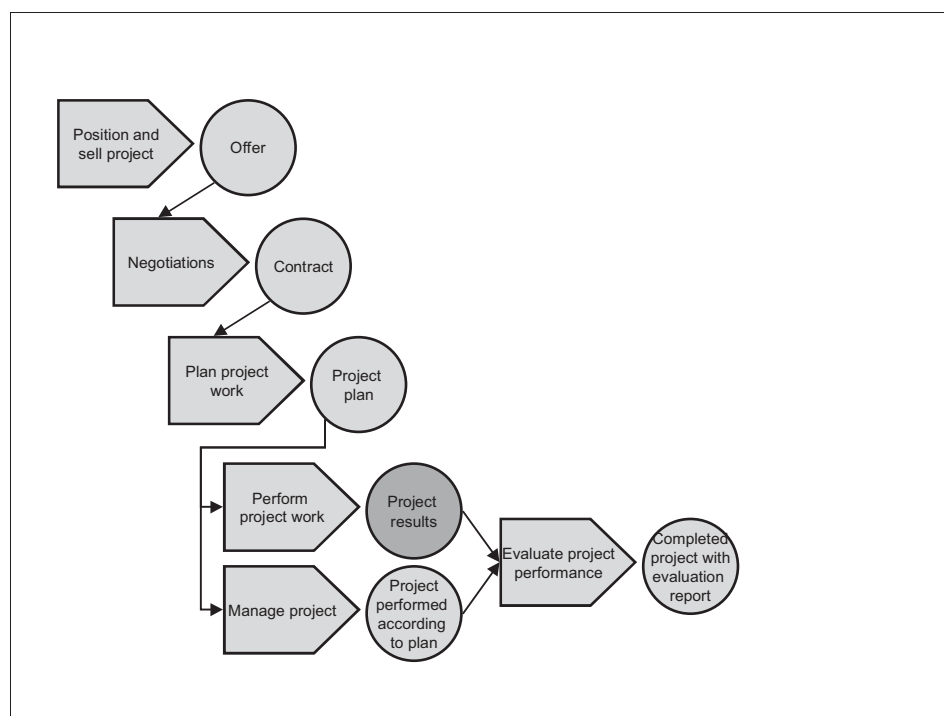
The most demanding part of the conferences was the construction of a joint process model. Even if we had started out with a common initial model, there were significant dissimilarities between the resulting models of each group after group work 2. These models had to be merged into one model. The Conference Leader started out by asking the plenary whether there were any of the three models that seemed to be a good place to start. We particularly asked whether any of the models seemed to contain much of what the other two models also had tried to achieve. After finding such a starting point, we gathered all the participants in front of that model. We then picked elements (processes/products) from the other models to replace parts of or add elements to the model we were working on. The Conference Leader also helped the participants question the logic of the model. This made sure that all parts of the process seemed to be covered, that terms and concepts matched, that all products had a process and vice versa, and that the end products made sense in terms of who the customer were.

As the process model was to be used as a basis for the design of an intranet, it was important that the participants also got to say something about what kind of information or tools they required in each sub-process in order to perform good and effective work. We held on to the same heterogeneous groups that we had in group work 2, and divided the sub-processes of the resulting joint process model between the groups. Each group used yellow stickers to attach the required information and tools to the process model on the wall. They could also signal if they required information that had been produced in earlier processes, or produced information that could be used later. This group work did not generate a very systematic input on information and tools, but the sum of the four conferences created valuable input to the further work. Besides, it gave valuable information on what meaning the participants attached to each sub-process in the joint model.



The outcome of each of the modeling conferences was documented in a report, which was distributed to all the participants. Thus they could check that the input they had given to the project was correctly represented.

The final task was to merge the resulting models from the four conferences into one ICG model. This was done at a change agent training seminar, where we gathered the process owners and change agents from all the four prioritized processes in order to give them a basic training in what the project, process thinking and modeling conferences was all about. We put all the processes next to each other on one paper, and asked them to find a common model that would do justice to all the models. The resulting models were rather dissimilar in visual image and complexity. But as one would expect, the main flow of the process was rather similar. This time, the participants were asked to take into consideration that the model needed to fit on a computer screen, and therefore it would be desirable to create several levels of processes, where some processes are sub-processes and other are sub-sub-processes. The resulting model is shown in Figure 4.



**Figure 4: The Process Execution process - final model. (Sub-processes are not shown.)**

The final model of the Project Execution process was turned over to the process group. They continued the work of making the model consistent and turn the models into an Intranet tool, both with the intention of simplifying work and support the continuous reconstruction of a joint Project Execution process.

## 7. EVALUATIONS OF THE RESULTS OF USING THE TECHNIQUE

Two different research projects have investigated the use and results of the process models developed through the modeling conferences. Følstad (2000) have used a survey method to map the relationships between participation, ownership, use, and changed mental models. Håkonsen and Carlsen (2000) have performed group interviews in a study focusing on communities of practice in ICG.

Følstad's study included participants at the conferences, pilot users, and organizational members who neither participated nor were pilots.

Følstad looks at two kinds of change: Acceptance of the model, and use of the model. Acceptance means that the actors perceive the model as a valid representation of their work situation. Use means both frequency of use, and the ways of use, in terms of language, consistency, and assumed future use.

The survey investigation was performed in two parts, at two different points in time.

The first survey was done right after the modeling conference. The second part was performed six weeks after the general deployment of the process model to the whole organization. In the second part, both participants of the modeling conference and other workers in the company was asked to get a broad sample. The two groups were chosen to be as equal as possible according to prior experience, department, skills etc., with the exception that the members of the first group had attended the modeling conference. The variables to investigate was operationalized in a survey form made specifically for this task.

The survey form included instruments to measure acceptance of the model and ownership. The measurements was developed according to the guidelines of DeVellis (1991). On the different questions, a 7 point Likert-scale was used. Negatively phrased questions were transposed. Scores were developed as mean values. There was a good spreading of scores across the scale used.

The first part was held right after the modeling conference. Data on the acceptance of the model ( $M=4.8$ ,  $SD=1.0$ ,  $N=34$ ) and ownership ( $M=5.0$ ,  $SD=1.0$ ,  $N=34$ ) was gathered. In the second part ( $N=78$ ) with members of the modeling conference ( $n=23$ ) and others ( $n=55$ ), the participants scored higher on acceptance ( $M=5.4$ ,  $SD=0.8$ ) than the others ( $M=4.5$ ,  $SD=0.9$ ). The same pattern was found on ownership ( $M=4.6$ ,  $SD=1.3$ ,  $n=23$ ) vs. ( $M=3.7$ ,  $SD=1.3$ ,  $n=55$ ).

To check this further, independent T-test was used. These found the differences to be significant both in connection to acceptance  $t(48)$ ,  $p<0.00$ , and ownership,  $t(43)$ ,  $p<0.01$ .

The scores from the participants on the first and second part on the acceptance of the model were compared. There was found a tendency on that the ownership on the first part was higher than on the second part. This difference was not significant  $t(38)$ ,  $p=0.13$ . The score on the establishment of the final version was significantly higher)  $t(50)$ ,  $p<0.01$  than one the one developed as part of the conference.

In addition, there are links from participation to ownership, which is defined as the actors' perceived responsibility towards and enthusiasm about the model. Ownership is again related to both acceptance and use. Thus it seems that participation in the Modeling Conferences has had a positive effect on the acceptance and use of the process model in two ways: Through the collective reflection and learning processes at the conferences, and through the informal ownership of the end result.

Among the pilot users, there was no co-variation between ownership and acceptance/use, or between perceived need and use. Følstad (ibid., p.67) assumes that this may be explained by the difference in the change processes the participants and the pilot users were part of. The participants in the Model Conferences went from a change in mental models, towards a change in behavior. The pilot users, through implementation and training, went from a practical change in behavior, towards a change in mental models.

As for validity and generalizeability of the results, we note that the results are according the the research hypothesis. They are also according to existing theory in the area, and the results and interpretations are discussed with the workers involved, and with other researchers being familiar with the organization.

As mentioned above, use of the model includes both frequency of use and other ways of use. The frequency of use of the model in ICG (after 2 - 3 months) was generally low, approximately once a week per user. Probably, this low frequency of use was because few new projects have been started

during that period. Even if this might seem discouraging, this pattern is often found in connection to introducing new methodology also in the IS Field (Krogstie, 2000). You do not change your methodology in the middle of a project, and Håkonsen & Carlsen (2000) also argue that use must be understood in a much broader sense. The process model on the Intranet is not only used to retrieve information. Through terminology development, it contributes to the establishing of a new and common understanding of one's own work. The model is also used in communication with customers, to explain how ICG work in projects, which may indicate that the actors identify with the process.

In their interviews, Håkonsen & Carlsen (2000) found that the process model is perceived as very good, in the sense that it gives a good description of project execution, and functions well as a tool for planning and starting projects. The model is considered relatively more useful for small branch offices and inexperienced project managers. It is seen as a supplement to information stored locally, and to traditional methods for information retrieval and knowledge transfer.

We think that the research results indicate that the Modeling Conference is an interesting method for developing process models, and that both the method and the models can support the development of encultured, embedded and encoded knowledge. Both the participants' ownership and the ways the visualizations on the Intranet are being used tend to improve the information retrieval, the coordination and the knowledge reactivation in ICG. Both Modeling Conferences and the Intranet implementation do of course have to be seen in relationship to other development activities.

## **8. CONCLUSIONS AND FURTHER WORK**

We have used the Modeling Conference in many different organizational settings including hospitals, banking, the building industry, universities and the power industry.

In the ICG case, we developed an initial process model in order to speed up the conference process. On the one hand, this may introduce unnecessary structuring to the conference, with the risk of the conference leader and process owner having too much model power. On the other hand, we have experienced that the participants often feel bewildered about the symbols and the work method unless they have an example. We still think that a conference that starts from scratch is the best solution, but in that case, it is vital that one has enough time (at least two days), so that the participants can become comfortable with the method and concepts. We suggest that it may be an interesting research topic to investigate how the use of an initial model influences the result and ownership of the models being produced.

One observation we have made is that some Modeling Conferences tend to be conservative. As the participants look for the common denominator in their different models, it is sometimes hard to introduce radically new ways of thinking about the process. First, this may not be a problem. The model will develop through use, and as long as we create organizational learning loops, and this learning can be taken into account, the new elements will be built into the model. What is important at the conference, is the common ownership. Second, radical ideas for redesign are often already present among the participants. If they do not come up during the conference, it is usually a problem of the defensive routines (Argyris & Schön, 1978) of the organization itself. It is however a challenge to facilitate the conference in such a way as to break these defenses.

We have considered introducing short talks to the conference, where some kind of expert was given the possibility to draw up their visions for the process. This may be a good idea as long as it is being taken as one point of view, and given the same validity as all other voices at the conference. However, we think that it will be even more powerful if the participants came up with the ideas themselves. We will do this in some future conferences through introducing group tasks to the conference where we challenge the participants to be more visionary and radical in their approach to the process.

Choosing the conference participants is difficult. The idea is that the whole process should be in the conference room, which means that representatives of all the work operations in the process should

be there, in addition to representatives of customers, suppliers, and other parts of the environment. This is not difficult in cases where the number of actors is so low that all can participate. When a selection has to be made, the choices about how to choose and who should choose are not straightforward. We have often created a project team, where we try to include representatives of all major actor groups, and have this group make the selection. In knowledge intensive companies, where most employees are professionals, this is not very difficult, because the local realities that we want to have represented are more based on profession than on class, union, etc. In more traditional industrial organizations, things are more difficult. No matter which organization or process, we do however stress the importance of having a clear understanding of the method, as the selection is a key part of the participatory process.

In the ICG case, the number of participants at each conference was between 15 and 25. We have managed to run conferences with up to 50 participants, but this requires quite a lot of time (as each group must be allowed to present their work after each group session). We have found that 12 to 15 participants are the lower limit, as it is useful to have at least three groups in order to have requisite variety.

A lot of the success of the conference depends on the conference leader. On the one hand he or she is necessary to maintain the structure and progress, to explain the method, and most importantly, to assist the participants in constructing the common process model. On the other hand, the conference leader should be almost invisible, in the sense that he or she is not responsible for the content and the result of the discussions.

As Gjersvik and Hepsø (1998) have discussed earlier, it is important that the model created is used as a basis for an Intranet or other work tools. This prevents that the conference ends up as a stand-alone event, without any subsequent action. What we aim for is embedded, encoded and encultured organizational knowledge (Blackler, 1995). In order to obtain this, the model must be enacted in everyday work. Of course, there is no guarantee that a process model developed through a Modeling Conference and implemented on an Intranet will constitute knowledge that is reactivated in organizational work. The research results from ICG do indicate that the Project Execution process is being used, both as a direct work tool and in the broader sense as part of the organizational language. The results do however point out that training and implementation also are important when it comes to reactivation of knowledge. In other cases where we have done a Modeling Conference without linking it with technology development, the participants have stated that the conference in itself has been important for the organization. It gave all actors a chance to discuss their work in a structured and participatory way. This is probably very useful for most organizations, but it limits the organizational learning to issues of how to communicate about their work, and who has the right to participate.

## ACKNOWLEDGEMENT

The research for and writing of this paper was made possible by the KUNNE research project ([www.kunne.no](http://www.kunne.no)), funded by the Norwegian Research Council. Development of the methodology was also done within the research program SiB - The Integrated Building Process. Also thanks to the anonymous reviewers for their input

## REFERENCES

- Argyris, C. and Schön, D.A. (1978): *Organizational Learning: A Theory of Action Perspective*. Addison-Wesley, Reading, MA.
- Berger, P.L. & Luckmann, T. (1966): *The Social Construction of Reality. A Treatise in the Sociology of Knowledge*. Doubleday, New York, NY.
- Blackler, F. (1995): "Knowledge, Knowledge Work and Organizations: An Overview and Interpretation." *Organization Studies*, Vol. 16, No. 6, pp. 1021-1046.
- Bråten, S. (1973): "Model Monopoly and Communication: Systems Theoretical Notes on Democratization." *Acta Sociologica*, Vol. 16, No. 2, pp. 98-107.

Davenport, T.H. (1993): *Process Innovation. Reengineering Work through Information Technology*. Harvard Business School Press, Boston, MA.

DeVellis, R. F. (1991). Scale development. Theory and applications. *Applied social research methods series*, vol. 26. Newbury Park: Sage Publications.

Emery, M. and Purser, R.E. (1996): *The Search Conference. A Powerful Method for Planning Organizational Change and Community Action*. Jossey-Bass Publishers, San Francisco, CA.

Flood, R.L. and Romm, N.R.A. (1996): *Diversity Management. Triple Loop Learning*. John Wiley & Sons, Chichester, UK.

**Fox and Gruninger: Enterprise Modelling, AI Magazine 2000**

Følstad, A. (2000): *Endring gjennom kunnskapsutvikling. (In Norwegian)* Master Thesis in Psychology. NTNU, Psykologisk institutt, Trondheim, Norway.

Gjersvik, R. (1993): The Construction of Information Systems in Organizations. PhD- thesis, Norwegian University of Science and Technology, Trondheim, Norway

Gjersvik, R. and Hepsø, V. (1998): "Using Models of Work Practice as Reflective and Communicative Devices: Two Cases from the Norwegian Offshore Industry." Paper presented at the *Participatory Design Conference*, Seattle, WA

Greenwood, D. and Levin, M. (1998): *Introduction to Action Research: Social Research for Social Change*. Sage.

Håkonsen, G. and Carlsen, A. (1999): "Communities and Activity-systems in Knowledge Intensive Firms." SINTEF Industrial Management.

Håkonsen, G. and Carlsen, A. (2000): *Teknologistøttet kunnskapsforvaltning i ICG: Oppdragsgjennomføring i ulike praksisfellesskap (In Norwegian)*. Report STF38 S00914 from the KUNNE Project. SINTEF Industrial Management, Trondheim, Norway.

Krogstie, J (2000): "Process Improvement as Organizational Development: A case study on the introduction and improvement of information system processes in a Norwegian Organization" in Irgens, B., Monteiro, E. and Nielsen, N. M. (Eds.) *Proceeding of Nokobit-2000*, Bodø, Norway November 20-22 2000 pp 101-118.

Krogstie, J. (2001): Using a Semiotic Framework to Evaluate UML for the Development of Models of High Quality In *Unified Modeling Language: Systems Analysis, Design and Development Issues*

Ed: Keng Siau, Terry Halpin, Microsoft Corporation, USA Idea Group, 2001

Loucopoulos, P. (2000) From Information Modelling to Enterprise Modelling in Brinkkemper, S, Lindencrona, E. and Sølvberg, A. (Eds) *Information Systems Engineering: State of the art and research themes*. Springer-Verlag.

Schuler, D. and Namioka, A. (1993) " *Participatory Design: Principles and Practices*" Lawrence Erlbaum Associates