7. Performance improvement and operations is continuously performing adaptations, or providing services to semi-automatically re-iterate structures and solution models, adjusting platform models and re-generating model-configured and -generated workplaces and services, and tuning solutions to produce the desired effects and results.

Collaborative Product and Process Design (CPPD) as mentioned above is anchored in pragmatic product logic, open data definitions and practical work processes, capturing local innovations and packaging them for repetition and reuse. Actually most of the components of the AKM platform, such as the Configurable Product Components – CPC and the Configurable Visual Workplaces – CVW, are based on documented industrial methodologies. CPPD mostly re-implements them, applying the principles, concepts and services of the AKM platform. CVW in particular is the workplace for configuring workplaces. This includes functionality to

- Define the design methodology tasks and processes
- Define the roles participating in the design methodology
- Define the product information structures
- Define the views on product information structures needed for each task
- Perform the work in role-specific workplaces
- Extend, adapt and customise when needed

Industrial users need freedom to develop and adapt their own methodologies, knowledge structures and architectures, and to manage their own workplaces, services and the meaning and use of data. The AKM approach and the CPPD methodology support these capabilities, enabling collaborative product and process design and concurrent engineering.

2.4 Participatory Modelling

An important aspect of modelling, is to be able to represent the knowledge as held by people as directly as possible. A practical limitation earlier was that the techniques and tools used were hard to use, thus often necessitating by design or by chance the involvement of an intermediary analyst. Newer approaches have shown the possibility of involving stakeholders more directly, often with the guidance of modelling facilitators.

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One approach to involvement of users is modelling conferences (Gjersvik et al. 2004). A number of other approaches exist, e.g. the use of DSL and AKM as described above and EKD and later use as described in (Persson and Stirna 2010).

2.4.1 The Modelling Conference Technique

The Modelling Conference is a method for participatory construction and development of enterprise models. In this, it takes as a starting point business process modelling to understanding how organisations work. However, while most approaches to the mapping and "re-engineering" of business processes tend to be expert and management focused, the Modelling Conference technique focuses on participation from all stakeholder groups, and the link between organisational learning and process institutionalisation through the use of technology.

The core of the Modelling Conference method has been adopted from the Search Conference method (Emery and Purser 1996). The Search Conference is a method for participatory, strategic planning in turbulent and uncertain environments. It has been used in various setting, including community development, organisation development, and the creation of research initiatives. It has also been done with a number of different designs. The method is based on a few basic ideas:

- Open systems thinking
- Active adaptation
- Genuine participation
- Learning

The concrete result of a Search Conference is a set of action plans, addressing various challenges that the conference have prioritised, and which people at the conference have committed themselves to implement. The plans may not always be congruent or coordinated, but there is a shared understanding among the participants on why each of the plans is important for parts of the system. This may be summed up in two core points:

- Action plans: "(…) multiple action plans focused on different parallel initiatives stand a better chance of diffusion than those that concentrate all their resources on one big hit." (ibid., p.63)

- Shared frame of reference: "(…) the Search Conference does not just result in more information and data about the environment. Rather, the Search Conference process also yields a shared view of the environment as conflicts or perceptual disagreements are made rational, data and information are integrated, and common ground is discovered." (ibid., p.67)

The Modelling Conference combines process modelling and search conferences, by doing process modelling in a structured conference setting, promoting broad participation. The argument for participation is discussed under Sect. 2.1.5.

A set of principles guides the Modelling 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 and techniques of the Modelling Conference:

- *Open systems thinking:* The unit of development (organisation, community, enterprise) is viewed as an open system, interacting with its environment. At the Modelling Conference, both the whole system itself and the main parts of the environment should be modelled. In the Modelling Conference, this might be called "open process thinking". The process is always in a context, interlinked with other processes and the rest of the contextual environment.
- *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 organisation 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 participation:* As in a search conference, the Modelling 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 analyse and understand the situation, and create suitable action plans.
- *Simplicity:* Modelling languages, methods and concepts should be simple so that it is possible for actors with various local realities to ex-

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press 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 organisation (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 visualisations 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 emphasise 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 organisation. 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.

A Modelling Conference is performed according to the following guidelines:

- The whole process is performed in one room (or a set closely positioned rooms when parallel group-work is performed). All relevant actors in the process should be present or represented during the modelling tasks. In many cases, this also includes outside actors, like users, owners, customers, and public authorities.
- The tasks alternate between group work and plenary work.
- The participants primarily represent themselves, but are jointly responsible for the content and result of the conference.
- The staff facilitates the work, and is responsible for the method used during the conference (but not the result).
- The modelling 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 this process model.

The modelling 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 (open circle)* and *intermediate products (filled circle)*.
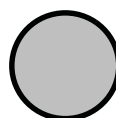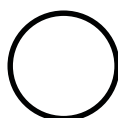
Customer: Someone who demands and uses the product of a process. Often, the customer is another process. For instance, the process "Install technical applications" is a customer of the process "Draw technical installations", and demands the product "Drawings of technical installations".

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 consolidated models.

The documentation from a Modelling 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. One always start with homogenous groups, where people with the same background develop their process models. After this, the participants are more comfortable with the modelling language and tools, and have more self-confidence about their own point of view. This is especially important in

organisations 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). One subsequently mix the participants in heterogeneous groups, where the whole modelling starts over again.

The difficult part of the agenda is after the second modelling 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 commonalties with what is found within the field of Participatory Design (Schuler, 1993), but focuses as we have seem primarily on enterprise modelling, and not the design of technical information systems.

2.4.2 Tasks and Roles in Participatory Modelling:

In (Persson and Stirna 2010), the authors describe in more detail the processes, roles and needed competencies for a (participatory) enterprise modelling practitioner, which often is the basis for further projects including IS implementation:

The core processes and needed abilities defined (described in Sect 2.1.5 above) are (Persson and Stirna 2010)

- Define the modelling process:
  - ability to select an appropriate EM approach and tailor it in order to fit the situation at hand

- Define scope and objectives of the EM project.
  - ability to define a relevant problem
  - ability to define requirements on the results
  - ability to establish a modelling project
  - ability to navigate between the wishes of various stakeholders
  - ability to assess the impact of the modelling result and the modelling process

More about assessing the organisation and the problem at hand is available in, e.g. (Nilsson et al 1999, Stirna et al 2007)

- Plan project activities and resources.
    - o ability to define requirements on the results
    - o ability to navigate between the wishes of various stakeholders
    - o ability to assess the impact of the modelling result and the modelling process

- Plan modelling sessions.
    - o ability to define a relevant problem
    - o ability to define requirements on the results

- Gather and analyse background information.
    - o Interview modelling participants.
    - o ability to interview involved domain experts
    - o ability to navigate between the wishes of various stakeholders

- Prepare modelling session.
    - o ability to define a relevant problem
    - o ability to adjust a presentation of project results
    - o ability to assess the impact of the modelling result and the modelling process

- Conduct modelling sessions.
    - o ability to model
    - o ability to facilitate a modelling session
    - o ability to navigate between the wishes of various stakeholders

More detailed recommendations of what to do and what not to do during a modelling session are available, for example, in (Jørgensen 2009, Sandkuhl and Lillehagen 2008, Stirna et al. 2007, Stirna and Persson 2009).

- Write meeting minutes. At this stage, the models should not be more refined because the main purpose of this activity is to send notes to the participants that might also serve as a reminder of the actions that they have agreed to be responsible for.

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- Analyse and refine models.
  - o ability to model
  - o ability to define a relevant problem
  - o ability to assess the impact of the modelling result and the modelling process

- Present the results to stakeholders.
  - o ability to adjust a presentation of project results
  - o ability to navigate between the wishes of various stakeholders
  - o ability to assess the impact of the modelling result and the modelling process

2.5 Chapter Summary

In this chapter, we have looked at IS-methodology more generally providing a general classification according to
- Goal of the methodology
- Coverage of process (development, use, operations, maintenance)
- Coverage of product (from a single application to a set of co-operating organisations)
- Capabilities needed
- Stakeholder participation
- Organisation
- Location

The historical development of IS-methodologies from the first methods in the late sixties is described briefly, before we discuss in more detail some of the current modelling-oriented approaches to IS development and evolution including

- Model driven architecture (MDA)
- Domain specific modelling (DSM) and domain specific languages (DSL)
- Business process modelling/Management (BPM)
- Enterprise modelling (EM) and Enterprise Architecture (EA)
- Active Knowledge Modelling (AKM)