3. Visualization and graphical modeling

The literature survey connected to visualization/graphical modeling started with a search in the academic literature based on two underlying questions:

- Which are the appropriate visualization/graphical modeling techniques connected to organizational development in a SME?
- What are the quality criterions for visualization/graphical modeling techniques used in organizational development activities?

During the literature survey I found three different graphical modeling techniques that **explicitly** are connected to organizational development: Rich Pictures; Mind Maps and Concept maps. None of these graphical modeling techniques where process oriented so the literature survey was expanded to include visualization/graphical modeling techniques that **implicitly** are connected to organizational development from the research fields of Information Systems Development (ISD) and User Centered Development (UCD). In order to explain the word implicitly I will give the reader an example: The Business Process Modeling Notation (BPMN) has been used to for several years create graphical models of the business routines in an organization, these graphical models are used both to improve the business processes (example of organizational development) and to describe the business processes in order to develop for instance an ERP-system. During the literature survey of ISD visualization/graphical modeling techniques I stumbled over the concepts of quality criterions and knowledge visualization which also will be described in this chapter. Notable is also how little quality criterions are described in ISD (Moody 2006).

The chapter contains five subchapters 3.1-3.5:

- The first subchapter (3.1) will give an overview of rich pictures, mind maps and concept maps.
- The second subchapter (3.2) will give an overview of the findings from visualization/graphical modeling techniques connected to Information Systems Development (ISD).
- The third subchapter (3.3) will give an overview of the findings from visualization/graphical modeling techniques connected to User Centered Development (UCD).
- The fourth subchapter (3.4) aims at describing the knowledge visualization framework.
- The fifth subchapter (3.5) aims to point out quality criterions relevant for visualization/graphical modeling techniques.

The aim of using visualization/graphical modeling is to enhance understanding and communication between the involved actors. In this thesis we do not intend to fully apply any of the formal visualization/ graphical modeling techniques in chap 3.1-3.3, we do, however, acknowledge the influence from the three different streams in subchapter 3.1-3.3. All the different visualization/ graphical modeling techniques will be discussed from two perspectives; the first perspective is the level of formalism and notation connected to a certain technique and the second perspective is a focus on the use in different problematic situations (Figure 7). The eleven

different visualization/ graphical modeling techniques described in chapter 3.1-3.3 have been interpreted based on the use and background. UML consists of thirteen different diagrams, for instance Use Cases and activity diagrams (Chapter 3.2.5). One part of UML is the group of structure diagrams (six different diagrams) which has been interpreted as visualization/graphical modeling techniques with high formalism and directed toward technology. Technology may not be correct word, but as a reader you can think of specific and concrete processes and relationships in a hard system (as defined by Checkland).

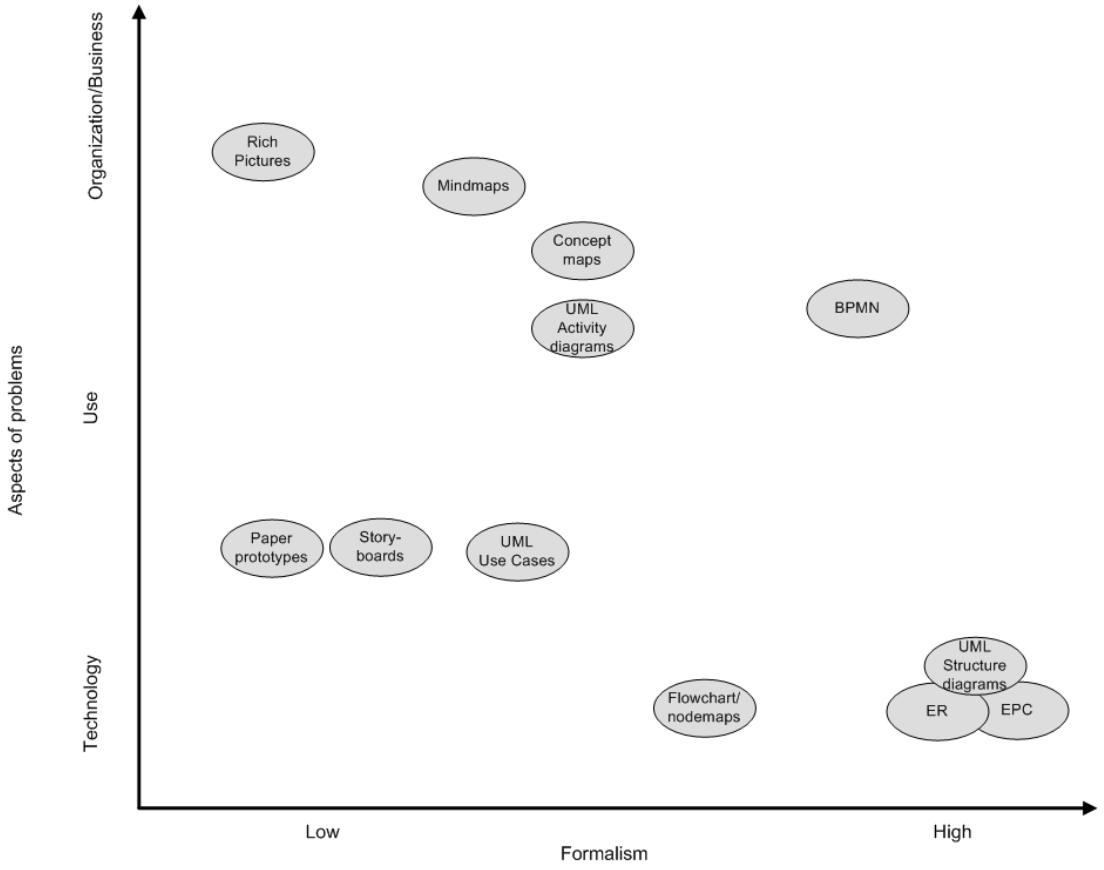

Figure 7: Summary based on formalism and problematic situation.

One observation that has its basis in interpreting visualization/graphical modeling from the perspectives of formalism and problematic situation is that there is no process-oriented visualization/modeling technique that is both informal and directed to organizational development (Figure 8).

The upper left corner in the diagram (Figure 8) is the focus in this thesis, visualization/graphical modeling techniques that is informal and connected to organizational development.

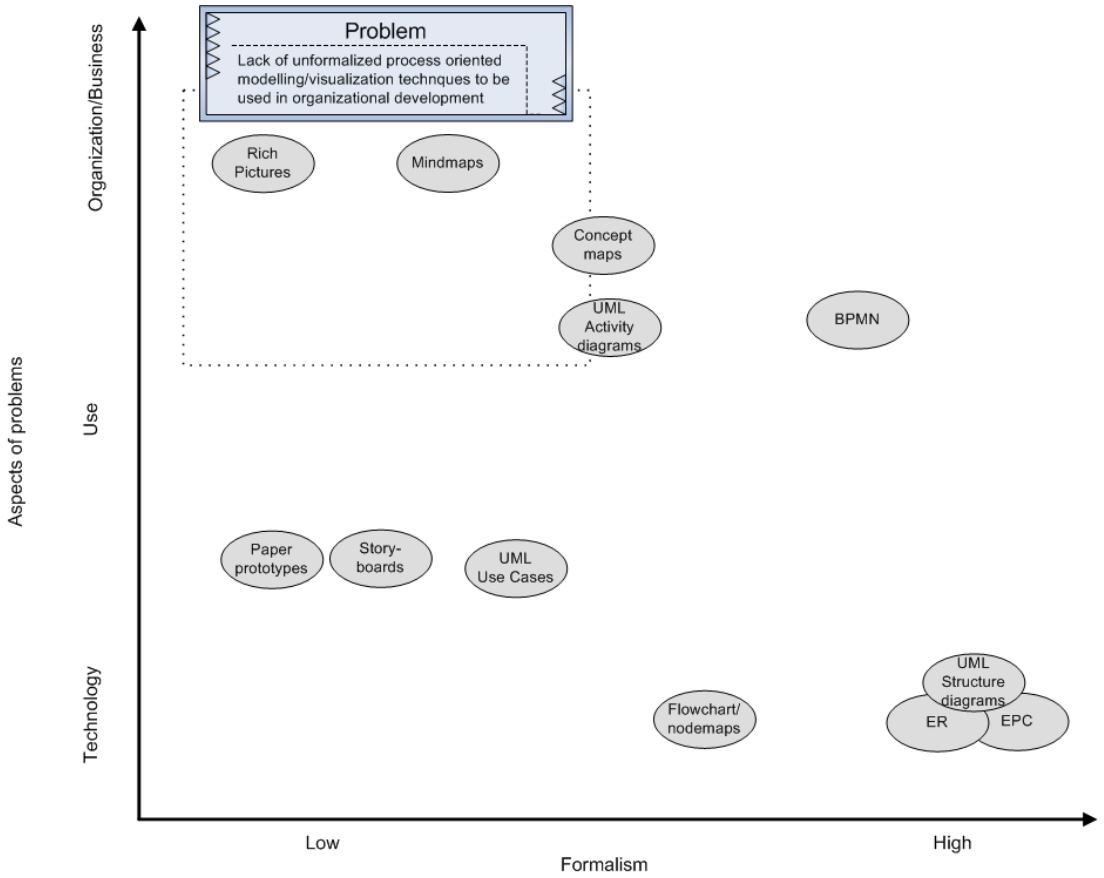

Figure 8: Motivating the problematic area.

All through this thesis I will use (and have used) both the words visualization and graphical modeling in describing the major focus. The reason behind this choice is that during the literature survey both words were used in describing activities and in order to embrace (not exclude) any activity connected to organizational development I will use both words. During the literature survey I also found the words graphical diagramming (Moody 2006) and graphical process descriptions (White 2004). The concept of graphical diagramming and graphical process descriptions are also interpreted as examples of visualization/graphical modeling.

In the literature from ISD the concept of graphical modeling were used very frequently such as UML-models, ER-models etc, the concept of visualization were mentioned very rarely, it is an activity performed early in the ISD-process often connected to the client/customer such as rich pictures, mind maps and visualized business process descriptions. In the literature from UCD it was nearly the opposite of the ISD literature, visualization (paper prototypes, sketches, storyboards) is mentioned frequently (Löwgren and Stolterman 1998; Löwgren 2004) and graphical modeling (flowchart, UML etc) is mentioned rarely.

A classic definition of visualization/graphical model is “the formation of mental visual images; the act or process of interpreting in visual terms or of putting into visual forms” (Owen 1999). A visualization/graphical model should be understandable, concise, efficient, and simple; it should reflect the “reality” (Gupta and Sykes 2001). The aim of using visualization/graphical model is to enhance understanding and communication between the involved actors. In this thesis we do

not intend to fully apply any of the formal visualization/graphical modeling techniques. We do, however, acknowledge the influence from the three different streams in subchapter 3.1-3.3. The focus is instead on the processes occurring when using visualization/modeling activities as a tool in communication and learning situations.

3.1. Rich pictures, mind maps and concept maps

This section focuses on three different visualization techniques: rich pictures, mind maps, and concept maps. The rich pictures technique is based on the work of Peter Checkland (1981) and it aims to express a problem situation informally (Checkland 1981; Checkland and Holwell 1998; Checkland and Poulter 2006). The mind map technique, used for many years, as referred to here is based on the work of Buzan (1995). The use of mind maps is connected to both business situations (brainstorming) and educational situations (note taking, thought clarifying) (Buzan 1995). Concept maps have their origin in the learning movement called constructivism, which holds that prior knowledge serves as a framework for understanding and learning new knowledge; here we will focus on Joseph D. Novak's work on concept maps (Novak 1991; Novak 1998).

During the interviews and seminars the researcher has used a mix of rich pictures, mind maps and concept maps. In Chap 5.3 and 5.4 the reader will get an idea of the visualization/graphical modeling technique that is used. Pure concept maps are also used in this in order to make a summary of the chapters 1, 2 and 4.

3.1.1 Rich Pictures

The aim of creating rich pictures is to capture, informally, the main entities, structures, and viewpoints in a situation, the process(es) going on, as well as the currently recognized issues and any other potential ones (Checkland and Poulter 2006). Rich pictures have been successfully used in dealing with "messy" social situations both inside organizations and outside organizations. There is no formal notation to follow when it comes to creating rich pictures, but there are some guidelines that have evolved over the years (Figure 9):

- Use a combination of pictures and words, and make sure that every part of the picture is sufficiently explained.
- When you use an arrow, label it with a limited set of annotations.
- A rich picture is not a solution, but rather an interpretation of a situation.
- A rich picture reveals information about the creators and their opinions.

In soft systems methodology, the rich picture is used in creating root definitions (Avison and Fitzgerald 1995) based on different weltanschauungs.

Rich pictures are considered as an informal visualization/graphical modeling technique oriented towards organizational problems (Figure 7-8).

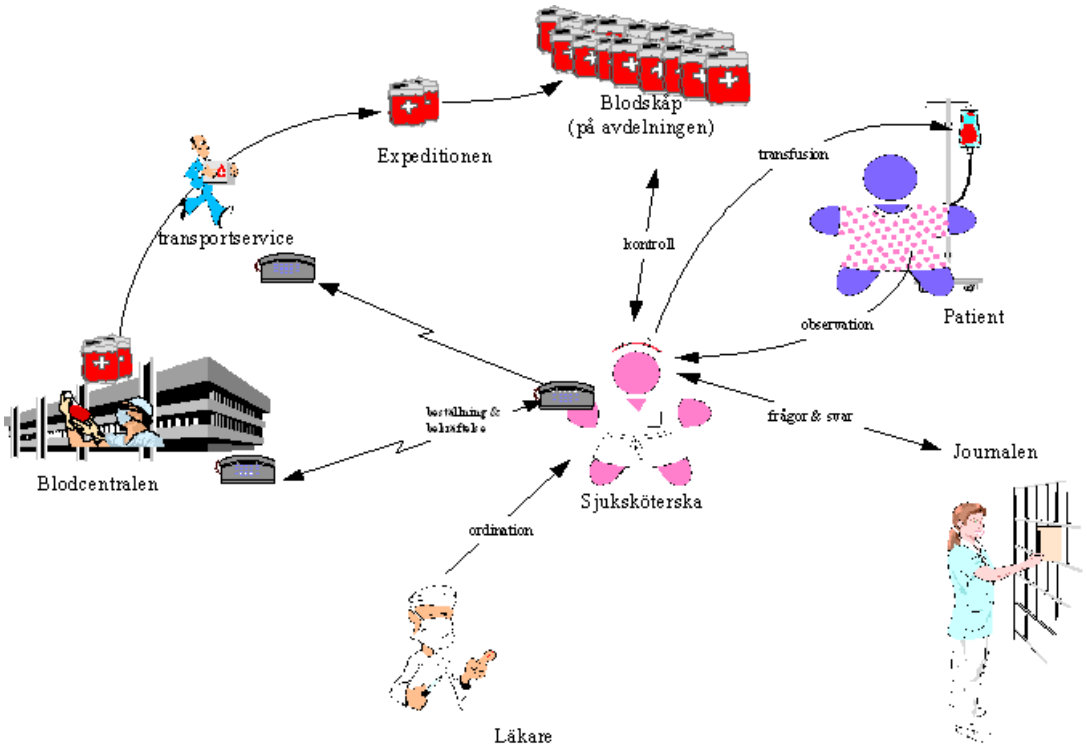

Figure 9. Example of a rich picture (Created during a course at Kristianstad University)

3.1.2 Concept maps

Concept maps aim to support the assimilation of key concepts and propositions into existing cognitive structures, indicating a focus on relationships. Concept maps are based on a tree structure and a hierarchy (Figure 10), and their starting point is the concept of interest. All the arrows/relations in a concept map should have a description (Novak 1991; Novak 1998).

Concept maps are widely used in education and business for note taking, mapping team knowledge, eliciting knowledge, facilitating the creation of shared vision and understanding, and communicating complex ideas and arguments (Novak 1991; Novak 1998). Joseph D. Novak, the inventor and developer of concept maps, has used concept maps in activities connected to organizational development with managers and staff members.

Concept map is considered as a semiformal visualization/graphical modeling technique oriented towards both individual and organizational problems (Figure 7-8).

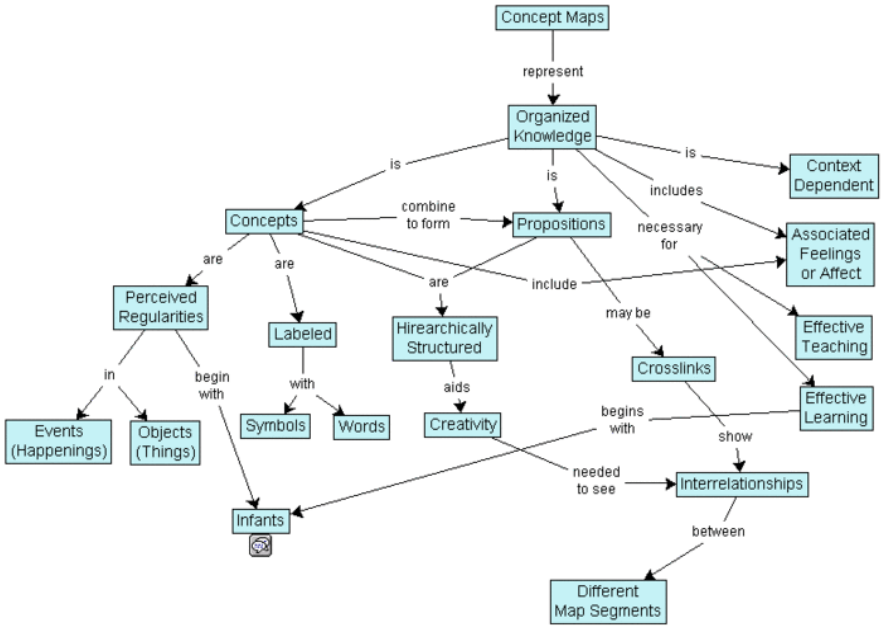

Figure 10. Example of a concept map (“Concept maps,” wikipedia)

3.1.3 Mind maps

Mind maps have applications in educational and business situation (Buzan 1995): note taking; brainstorming; summarizing; revising and general thought clarifying. The aim of a mind map is to represent words, ideas, tasks, or other items linked to and arranged radially around a central key word or idea. It is used to generate, visualize, structure, and classify ideas. Mind maps are a useful tool in activities related to organizational development, problem-solving and decision-making. It is an image-centered diagram that represents connections between portions of information; by presenting these connections in a radial, non-linear graphic manner, it encourages a brainstorming approach to any given organizational task (see Figure 11).

Mind maps are considered as an informal visualization/graphical modeling technique oriented towards both individual and organizational problems (Figure 7-8).

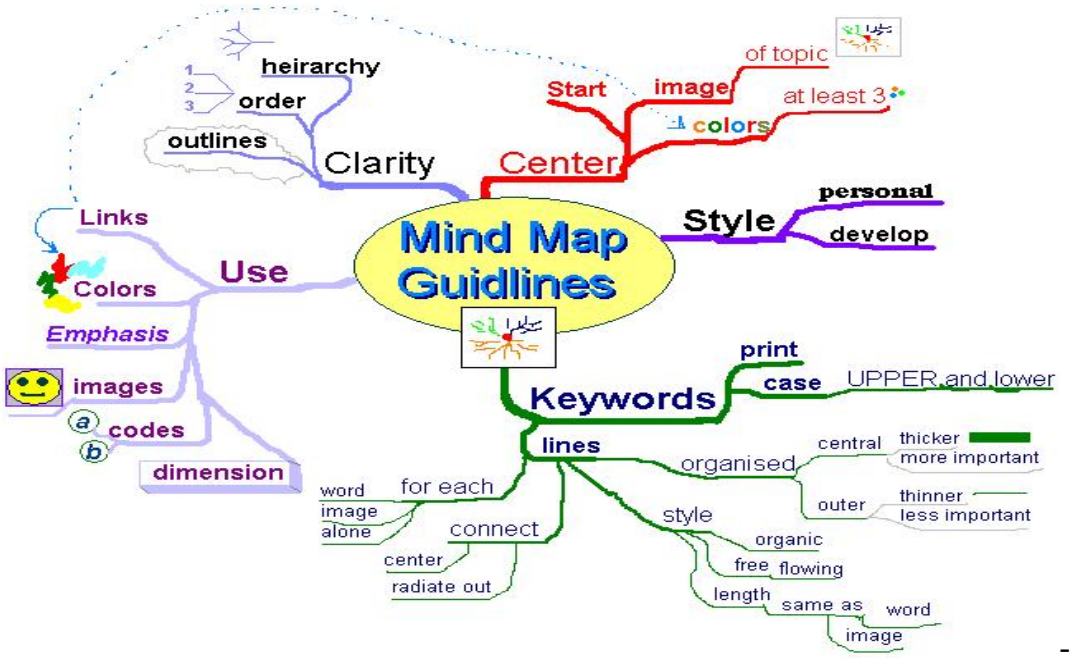

Figure 11. Example of a mind map ("Mind map," wikipedia)