

# Abstract

This thesis is a study of how to design and introduce computer support in co-present collaborative creativity.

Creativity is an important skill in today's knowledge based society. There has been an increased focus on computer support for creativity, but a shift from individual to collaborative creativity demands a new set of frameworks and requirements for designing suitable tools.

Evolving technologies in the merge of computer support for cooperative work (CSCW), ubiquitous computing and mobile technologies have shown promising results and relevance in collaborative and creative work. This thesis is a study of how such technologies can support co-present collaborative creativity. The objective is to identify elements and structures constituting co-present collaborative creativity in order to define a set of requirements and implications for designing computer based tools.

The contributions of the thesis is:

1. A conceptual framework describing elements, structures and general patterns in co-present collaborative creativity
2. A guideline describing requirements and implications for the design and introduction of computer based tools, including a description of which tasks can be supported and scenarios showing how.

The thesis is both theoretically and empirically based. The theoretical base includes theoretical views and research within the creative domain and related work in the field of computer support for creative work. The empirical evaluation includes a case study of Oasen, an idea laboratory at the Norwegian University of Science and Technology (NTNU). The framework and the guideline presented as the results of the thesis are generalized based on a comparison of empirical results with findings in related work.

# Preface

This thesis is my Master of Science thesis in Informatics at the Department of Computer and Information Science at the Norwegian University of Science and Technology (NTNU). The work has been conducted from the winter of 2004 to the summer of 2005.

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# 1 Introduction

*“There is no doubt that creativity is the most important human resource of all. Without creativity, there would be no progress, and we would be forever repeating the same patterns.”*

- Edward de Bono (1967)

Creativity is an essential skill in today’s knowledge based society where the demand for new solutions to new problems increases. Creativity is seen as a competitive advantage both in private and public businesses, as well as in research and education. But; we are still stuck in the old working patterns from the traditional industrial society. In order to enable and support creativity there is a need for new working processes, new organizational patterns and new tools.

Computer technologies are an essential part of everyone’s daily life and work. The evolution within computer science has led to an increased belief in computer support for creativity: Computers are no longer considered to be *“restricted only to enhancing productivity, but they also opens up new creative possibilities”* (National-Research Council, 2003).

Research within creativity have traditionally focused on creativity as an individual ability. Most research within computer support for creativity have therefore until recently focused on individual creativity. There has been a shift in focus towards collaborative creativity. This shift demands a new set of models, frameworks and requirements in order to develop or find suitable tools supporting it.

When considering computer support for collaborative creativity, it is quite natural to study computer support within the domain of computer support for cooperative work (CSCW): Looking at technologies supporting collaboration, and then consider the potential of using such technologies to support collaborative creativity. Evolving technologies in the merging fields of CSCW, ubiquitous computing and mobile technologies have shown promising relevance for collaboration and creativity. This thesis is therefore a study on how to design and use such technologies to support co-present collaborative creativity. The objective is to identify and define elements in co-present collaborative creativity in order to establish a conceptual framework and a guideline for the design and introduction of computer-based tools.

My research in this thesis will start with a thorough exploration of co-present collaborative creativity in order to find out which elements it consists of, and which elements can be supported or even enhanced by the use of computer technology. In order to do so I will study collaborative creativity in practice at Oasen – an idea laboratory at NTNU. I will use their understanding of creativity and their creative work as my case, as described in chapter 4.

The results from observations and analyses in the case will form the basis for a descriptive framework conceptualizing co-present collaborative creativity, as presented in chapter 7. Observations, analyses and feedback from the facilitators working in Oasen will be used as initial requirements and directives when testing ICT tools in the creative work. Observations and the results of the testings will form the basis of a guideline describing how to design and introduce computer based tools in co-present collaborative creativity, as presented in chapter 11.

The research focus in the thesis is in the intersection of two domains: Creativity and CSCW. A theoretical introduction to the domains is therefore given in the following sections, before defining the problem definition and research questions in chapter 2.

# 1.1 Creativity

Creativity is:

- *“The ability or power to create. Productivity with originality and expressive qualities; imagination; newness.”* [8]
- *“Creativity is the act of bringing something into existence that is genuinely new, original, and of value either personally (of significance only to the individual or organization) or culturally (adds significantly to a domain of culture as recognized by experts).”* [9]
- *“Creativity is seeing new possibilities, being able to connect familiar things in new ways”* (Herrestad, 2005).

## 1.1.1 Components in creativity

Creativity is a multi-faceted and complex term and domain, but definitions (Couger, Higgins, McIntyre, 1993; Haug, 2002; Herrestad, 2005; Csikszentmihalyi, 1996) reveals five intertwined components:

- The creative person
- The creative process
- The creative product or result
- The creative experience or flow
- The creative environment

### 1.1.1.1 The creative person

A person can be defined as creative referring to the person’s cognitive abilities (Masseti, 1996; Csikszentmihalyi, 1996). Traditionally, creativity is often linked with people’s artistic abilities and seen as an important element within art and music, but there has been a shift in who is viewed as creative individuals and within which domains creativity normally will blossom: *“Creativity is no longer seen as an activity purely associated with particular disciplines, such as drama, music, or art, but as a process that can be mobilized across much wider domains. In addition, creativity is no longer seen as something that only a privileged few are capable of, or that’s confined to major innovations, but as an adequate potential in all young people”* (Facer and Williamson, 2004).

Modern research shows that *“creativity is present in everyone”* and that it is an ability that can be stimulated, trained and supported (Couger et al., 1993). Creativity is viewed as a muscle or potential in all people - it’s an ability that needs to be trained in order to stay fit (Haug, 2002). And some claim that adults lose some of their creative abilities due to the fact that they get used to norms and live according to experiences (Herrestad, 2005; Haug, 2002; Couger et al., 1993). It is therefore important to support creativity by stimulating people; both through enabling group collaboration, supply stimulating environments and teach them or refresh their memories on how to work creatively (Herrestad, 2005; Haug, 2002; Csikszentmihalyi, 1996, Couger et al., 1993; Davidson and Sternberg, 1984). This is what my case, Oasen, focuses on, as described in chapter 4.

### 1.1.1.2 The creative process

The process of creative thinking is defined and referred to as the creative process, with many attempts in identifying and modeling the exact steps involved (Plsek, 1996).

One of the earliest models suggested was defined by Wallas (1926) where he proposed that creative thinking proceeds through the following four stages:

1. Preparation (definition of issue, observation and study)
2. Incubation (laying the issue aside for a time)
3. Illumination (the moment when a new idea finally emerges)
4. Verification (checking it out)

The implied theory behind Wallas' model is "*that creative thinking is a subconscious process that cannot be directed, and that creative and analytical thinking are complementary*" (Plsek, 1996). A great deal of models and research have built on Wallas' model where the focus has been heavily on the theory of "*subconscious mental processes and uncontrollable events*" (Plsek, 1996).

Rossman (1931) and Osborn (1953) extended Wallas' four steps to seven, building on the understanding of creativity as the balance of analysis and imagination. Osborn's model includes the following seven steps:

1. Orientation: finding the problem
2. Preparation: gather relevant data
3. Analysis of the relevant material
4. Ideation: finding alternative ideas
5. Incubation: take a break in order to invite illumination
6. Synthesis: putting the pieces together
7. Evaluation: judging the resulting ideas

Plsek's review (1996) of the theory and models of creative process shows that the predominant models lean more on the theory that novel ideas emerge from the conscious effort to balance analysis and imagination, and not "*creativity as a somewhat magical process.*" Perkins (1981) and Plsek (1996) argue that subconscious mental processes is the basis for all thinking, and therefore play no extraordinary role in creative thinking. Plsek (1996) claims that "*just because we cannot fully describe our thought processes, does not mean that we are not in control of them*".

In his review of various models of creative thinking, Plsek (1996) tries to summarize them in his own model “*Directed Creativity Cycle*” where the main steps are *preparation – imagination – development – action*.

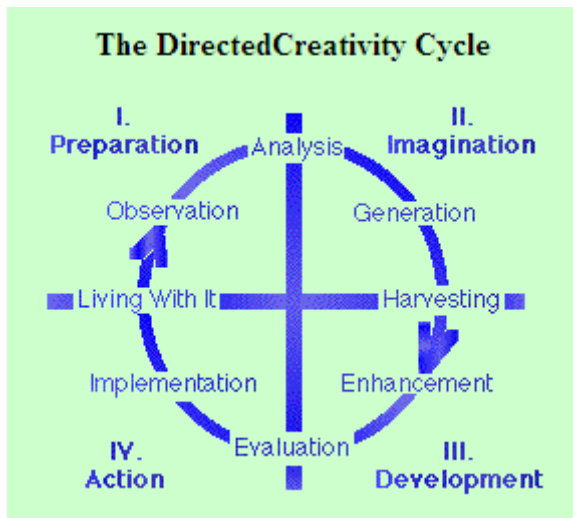


Figure 1 The Directed Creativity Cycle (Plsek, 1996)

There are a large number of different models for the process of creative thinking, but as Plsek (1996) claims in his summary, there are a few common themes:

- The creative process includes an **analysis** of the problem or task, an imaginative **idea generation** and an **evaluation**. The models also show that it requires action and effort to drive the ideas forward from being just ideas to **implementing** and realizing them.
- The creative process is a balance of imaginative thinking and logic reasoning and analysis.
- Older models assume that creativity results from subconscious processes outside the control of the creator, while more modern models claim a purposeful generation of ideas under direct control of the creator.

Herrestad (2005) adds a new important element to the creative process when she claims that someone must take control, lead and stimulate the process – **a process leader**, especially in groups where the participants are quite unfamiliar with creative work. This component arises within the modern understanding of creativity as collaboration in groups, described in section 1.1.2.3, where one also believes in teaching and training people’s creative abilities as described in section 1.1.1.1.

### 1.1.1.3 The creative result

The creative result is simply the results from creative thinking in a creative process. The result can take many forms; it can be an abstract mental idea, it can be a well-defined solution to a problem, it can be a picture or a sketch, and so on. Creative results differ from the results of ordinary logic thinking in that they involve something “*new, unusual and original*” [7]. The results must be something new that gives value either to the person creating it [9] or to the domain or culture in which the creation is made (Csikszentmihalyi, 1996).

#### 1.1.1.4 Creative experience and flow

The creative experience is “*a special feeling and state of mind where your focus is on creating*” (Haug, 2002). The well-known psychologist Csikszentmihalyi defines this state of mind as creative flow (1996). Some claim that flow is one of the most important conditions in order to be creative or produce creative results: “*Creativity is more likely to result from flow states*” (Vass, Carroll and Shaffer, 2002).

Flow is “*the feeling of complete and energized focus in an activity*” [6]. Csikszentmihalyi (1996) himself defines flow as the optimal experience and the feeling one get “*when things are going well as an almost automatic, effortless, yet highly focused state of consciousness.*” Csikszentmihalyi (1996) further defines nine conditions that have to be supported in order to reach the state of flow in an activity, such as a creative process. The nine conditions are:

1. Have *clear goals* so that one knows what needs to be done.
2. Get *immediate feedback* to one’s actions so that you know how well you’re doing
3. Keep a *balance between challenges and skills* so that we feel that our abilities are well matched to the opportunities for action.
4. Actions and awareness merges: our *concentration* is focused on what we do.
5. *Distractions are excluded*: We are aware only of what is relevant here and now.
6. There is *no worry of failure* because one is too concentrated to worry
7. *Self-consciousness disappears*: One is too involved in the action to consider caring about protecting the ego.
8. The sense of time becomes distorted: *We forget about time.*
9. *The activity becomes autoletic*; meaning the activity in itself is so enjoyable and interesting that one does it just for doing it. Examples of such activities are typically art, music and sports. Most other activities are exotelic, meaning we do them to reach a goal.

#### 1.1.1.5 The creative environment

Csikszentmihalyi (1996) and others (Herrestad, 2005; Couger et al, 1993) also define the environment as an important component in creativity: The environment can both stimulate or trigger creative thinking – get the creative person started on a creative process, and enable or support creative flow. Some (Geis, 1988; Couger et al., 1993; Williams and Yang, 1999) focus on organizational elements ensuring a creative climate; like for instance having a managerial willingness to take risks in order to enable creativity and innovation, or providing people with formal and informal training to enhance creativity (Geis, 1988). Others, like Csikszentmihalyi (1996), focus more on the “*spatiotemporal context*” – the shape and design of the physical environment. For instance, which furniture to use and how to arrange it, or the use of colors to stimulate the senses.

#### 1.1.1.6 The interplay and connection between the components

The components are highly interactive with each other (Couger et al., 1993): Stimulating people’s creative abilities can start the creative process, which again can be supported through a creative environment. Haug (2002) defines the creative process as “*the stage where you are inspired and develop ideas*” and states that this is usually how you get a creative experience. He further explains that the creative product is usually the result of a creative process, and that it can be “*for instance; a piece of art or the solution to a problem*” (Haug, 2002).



## 1.1.2 Collaborative creativity and other theoretical views

Research on creativity has according to Williams and Yang (1999) been focusing on three aspects :

- What creativity is (its components within the mind of the individual)
- How creativity works at the interface of the individual and the environment
- The systems consisting of groups of individuals collaborating on creative products within organizations

These three aspects clearly show the historical development of the theoretical views and research focus on creativity, which initially started with research on **individual creativity**, then focus shifted to what many call **the systems view** (Williams and Yang, 1999), and then the latest focus - **collaborative creativity**.

### 1.1.2.1 Individual creativity

Traditionally, research has dealt with the individual capabilities where creativity has been defined as “*part of human cognitive activity*” (Masseti, 1996). The focus has been on the individual creator and his or her “*personality, traits, abilities, experiences, and thought processes*” where creativity has been seen as “*the product of a special individual in an isolated moment of insight*” (Williams and Yang, 1999). Large parts of research on creativity have been dedicated to find out more about the exact steps involved in the creative thought process of the individual, as described in section 1.1.1.2.

### 1.1.2.2 System-oriented views

A problem with the individual views on creativity is that “*they often neglect the cyclical relationship that can develop between the individual and the environment*” (Williams and Yang, 1999). A system-oriented view arose as a response to this problem where the focus has been on how the environment influences the individual creator (Csikszentmihalyi, 1996; Williams and Yang, 1999). The system view studies how the environment affects the creative thoughts of the individual. For instance, how it motivates or triggers them. But as Williams and Yang (1999) point out: A system-oriented perspective can still be viewed as an “*individual phenomenon*”, where the only difference from individual creativity is that “*the creative process is perceived as taking place within the context of a particular environment rather than in a vacuum.*”

### 1.1.2.3 Collaborative creativity

“*...recent years has begun to paint a more complicated picture of creativity that highlights the importance of social interactions, mentoring, and collaboration in creative work*” (Mamykina, Candy and Edmonds, 2002). There has been a radical shift in focus from individual creativity and system views towards social and collaborative creativity (Mamykina, et al., 2002; Facer and Williamson, 2004, Sundholm et al., 2004). Creativity is no longer just viewed as an individual ability, the ability to think differently or creative, but also a social ability – being able to collaborate and communicate with others in order to get inspired and have creative thoughts arising in a social setting.

There are different terms describing the understanding of creativity where the focus is on social interaction, team work and collaboration. In this thesis I choose to focus on the term

collaborative creativity as defined by Sundholm et al. (2004), which focuses on co-located collaboration, and an understanding of collaborative creativity as defined by Facer and Williamson (2004) where collaboration is defined as *“something more than just ‘working alongside’ each other. ...collaboration in its truest sense is to do with the joint development of understanding.”* Facer and Williamson (2004) emphasize that the main elements in collaboration are transformation and sharing: *“Sharing; meaning that individuals have contributed to, reflected on, and justified opinions and ideas with others.”* And *“transformation; meaning that each participant comes away from the collaboration with new knowledge that has been exchanged and learned from others.”* Collaborative creativity is people sharing ideas, building new knowledge and learning from each other in order to come up with creative ideas and results. *“In collaborating groups, the group becomes more than the sum of its parts, as creativity emerges from a dynamic exchange between the participants”* (Sawyer, 2003).

### **1.1.3 Computer support for collaborative creativity**

Computer technologies are an increasingly important part of everyone’s life and work, and it is natural to consider computer support for collaborative work, as for any other types of knowledge based work. The shift in focus from individual to collaborative creativity demands a new set of frameworks and requirements for the design of tools supporting collaborative creativity. The domain of computer supported cooperative work (CSCW) is a natural starting point: Looking at technologies and tools designed to enable and support collaboration. An introduction to the field of CSCW is therefore given in the next section.

## 1.2 CSCW and groupware

The term computer supported cooperative work (CSCW) was introduced by Greif and Cashman in 1984 (Grudin, 1994). CSCW is the study of “*how collaborative activities and their coordination can be supported by computer systems*” (Carstensen and Schmidt, 2002).

Groupware can be defined as “*computer-based systems that support groups of people engaged in a common task (or goal) and that provide an interface to a shared environment*” (Ellis, Gibbs and Rein, 1991).

Groupware is often considered to be a synonym to CSCW, but most authors claim that groupware refers to the actual computer-based systems, whereas CSCW is the overall research field which “*focuses on the study of tools and techniques of groupware as well as their psychological, social and organizational effects*” [6]. CSCW is a research field dealing with overall questions, while groupware is the product (program) resulting from the research done in the CSCW field (Divitini, 2004).

Groupware can be classified in many ways, but the most well-known taxonomy is the 2x2 matrix which classifies groupware using two axes: *time* and *place* (Ellis et al, 1991; Dix, Finlay, Abowd and Beale, 1998; Divitini, 2004). The two axes are further divided into four elements forming four categories: Collaboration between people can by the support of computer systems take place at the same time, *synchronously*, or at different times, *asynchronously*. The people involved can either be physically present in the same space, *face-to-face* or co-located, or they can be located at different places, being *distributed*. Groupware systems are therefore divided into the following four categories supporting collaboration where people are:

- In the same space at the same time – *face-to-face*.
- In the same space, but at different times – *asynchronous*.
- Physically distributed, but present at the same time – *synchronous distributed*.
- Physically distributed and present at different times – *asynchronous distributed*.

	Same time	Diff. times.
Same Place	<b>Face-to-face</b>	<b>Asynchronous</b>
Diff. places.	<b>Synchronous distributed</b>	<b>Asynchronous distributed</b>

Figure 2 Groupware taxonomy (Divitini, 2004)

Most research within CSCW today focuses on supporting collaboration for distributed teams (Stewart, Bederson and Druin, 1999, Bardram and Bossen, 2003). My work in this thesis will focus on supporting collaborative creativity where people are located at the same place and at the same time – *face-to-face* or co-present; present in the same room.

### 1.2.1 Research focus within CSCW

Research within CSCW has followed the progress in computer science: First were mainframes, each shared by lots of people. Then came the personal computing era where each person had their own desktop machine – therefore often referred to as the desktop-metaphor. And now we are moving on to what some call the third paradigm or the era of ubiquitous computing, where each person uses many computers and where “*technology recedes into the background of our lives*” (Weiser, 1996).

The field of CSCW is quite new compared to the field of computer science. The term CSCW was introduced in 1984 and the field of research evolved in the early 90’s. Research has therefore up until recently focused on the desktop-metaphor. As Internet and networking evolved in the mid 90’s, research very much focused on supporting cooperation in distributed teams (Inkpen, Mandryk and Scott, 2002), enabled by networks of desktop computers.

Weiser introduced the notion of ubiquitous computing in 1991 describing a new paradigm where technology should be invisible tools integrated in the surroundings and not interfering with human consciousness (Weiser, 1991). Instead of each person having one desktop computer, Weiser visioned smaller and smarter computers residing invisible in the natural surroundings, which enabled interaction with the users without taking focus away from the tasks they want to perform or solve (Weiser, 1994). Ubiquitous computing, or ubicomp, evolved in the beginning of the 21<sup>st</sup> century, and also helped kick off research within lightweight, mobile and tangible technologies.

Research within CSCW has, due to the evolving development of ubicomp and mobile technologies, shown a growing interest in those fields. That is one of the reasons why there has been a shift of focus from solely supporting distributed teams to also including and focusing on support for collaboration in physically present or co-located teams (Sundholm et al., 2004).

### 1.2.2 Cooperation or collaboration?

A lot of confusion is connected to the usage of the terms cooperation and collaboration. Many authors simply use both terms as synonyms, while others like Dillenbourg, Baker, Blaye and O’Malley (1995) draw distinctions between them :

*“Cooperation and collaboration do not differ in terms of whether or not the task is distributed, but by virtue of the way in which it is divided; in cooperation the task is split (hierarchically) into independent subtasks; in collaboration cognitive processes may be (heterarchically) divided into intertwined layers. In cooperation, coordination is only required when assembling partial results, while collaboration is a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem.”*

In other words; one can roughly say that cooperation means working individually on separate subtasks in order to reach the same goal, while collaboration means working or maybe even ‘thinking’ together on the same task. The similarity lies in the fact that they both involve a group working together to reach the same goal, instead of working separately in competition with each other. During this thesis I might use both terms, but my focus is to study how technology can support the above mentioned definition of collaboration, not just cooperation.

And as mentioned, my focus will be on collaborative creativity where people communicate and share in order to establish new knowledge, generate creative ideas and results.

## 1.3 Overview of the thesis

I start this thesis by giving a short theoretical introduction to creativity, CSCW and groupware in the following sections. This introduction is then the basis for the problem definition and the research questions as presented in chapter 2. Chapter 2 also provide an overview of the research structure of the thesis; visualizing which chapters are trying to answer which research questions.

Chapter 3 is a short description of related work in the field of computer support for creative work. It starts with a description of a framework for introducing technology in creative work as described in section 3.1. Section 3.2 presents and discuss related work in the field of computer support for creative work as described and section 3.3 gives a brief evaluation of relevant technologies in the merge of CSCW, ubiquitous and mobile technologies.

Chapter 4 is an introduction to my case Oasen, an idea laboratory at NTNU. It briefly describes their understanding and implementation of collaborative creativity. Further description is given in the analysis conducted in chapter 6.

Chapter 5 presents an overview of my empirical material and method of approach.

Chapter 6 presents an analysis of creativity in Oasen. It starts with an analysis of written documentation and feedback from facilitators forming an initial understanding of elements constituting co-present collaborative creativity in section 6.1. Section 6.2 provides a similar analysis of the structure in the creative work at Oasen. Section 6.3 presents analyses of observations of creative processes in Oasen.

Chapter 7 describes a conceptual framework for co-present collaborative creativity based on the results and the analysis in chapter 6. The focus of the framework is elements and structures in the creative process as described in section 7.2, with emphasis on a general pattern as described in section 7.2.1.

Chapter 8 is based on feedback from facilitators working at Oasen. The chapter describes their perspective on how to design and introduce computer based tools in creative work, defining a set of requirements and implications as listed in section 8.2.

Chapter 9 and 10 describes testing of ICT tools in Oasen including considerations prior to the testing, description of the tools and the settings, results and analyses. Section 9.3 describes testing of PDAs, section 9.4 describes testing of electronic whiteboards and chapter 10 describes testing of digital pen and paper.

The results from the testing was compared to the results from observations in section 6.3, the framework in chapter 7 and findings in related work in section 3.1, and form the basis of the guideline presented in chapter 11. The guideline starts by listing a set of requirements and implications for the design and introduction of computer based tools in section 11.1. Section 11.2 gives a description of which tasks and creative stages is suitable for ICT support, and section 11.3 presents a set of scenarios showing how it can be done.

A short evaluation of this study is presented in chapter 12 together with suggestions for further work. Chapter 13 sums it all up in a conclusion.

## 2 Problem definition and research questions

### 2.1 Problem definition

The demand for new solutions to new problems increases. Norway and the western world is becoming a knowledge based society where creativity and innovation is considered very important skills. *"There's a large demand for innovation and creative thinking in both private and public enterprises."* [5] Creativity and innovation is needed in order to survive as a business or employee – it is considered to be a very important competitive advantage: *"Because organizations seek more innovative ways to compete, the ability of their employees to generate new and valuable ideas becomes a fundamental survival skill"* (Masseti, 1996).

Even though creativity is viewed as one of the most important skills and driving power in the development of new solutions, there is a major concern due to the fact that our working culture is still stuck in old organizational patterns from traditional industry [1]. People are not used to working creatively, and the tools and the environment is not designed to support creative work. It is therefore necessary to define and develop new working processes, new organizational structures and new tools in order to develop new products and services which are compatible in the rapidly changing markets [5].

One way to deal with this issue is by studying organizational structures and environmental influences on creativity, such as the research of Williams and Yang (1999). Another way is enabling research and training facilities where people are introduced to creative thinking and working methods, such as the idea laboratories Oasen [1] and Stig & Stein [16]. A third approach, which is the case in this thesis, is studying tools supporting creativity. The reason for this approach is the increased focus on computer support for creativity, as described in the section 2.1.1.

Organizational structures, working methods and tools enabling and supporting collaborative creativity are related in complex manners, and can therefore not be studied as isolated elements. For instance, studying tools also means studying relevant work methods. I choose to solve this issue by studying collaborative creativity in a case where all elements are apparent: The case of choice, as described in chapter 4, is a well-functioning idea laboratory with focus on breaking traditional organizational structures, developing new work methods and using a large range of tools in order to support creative thinking.

### 2.1.1 Increased focus on computer support for creativity

Couger et al. wrote in 1993 that: *“The subject of creativity is a neglected area in the literature of the information systems field”* (1993), but this is now changing: *“The usage of ICT for augmenting creativity is gaining a growing attention”* (Divitini, Lippe and Schjetne, 2004), and the main reasons for this increasingly interest is that:

1. Increased focus on creativity in society and business also increases the focus on elements such as the tools enabling and supporting creativity. And as we all know: Today’s society is very much computerized, and it is therefore natural to consider computer-based tools for supporting creativity.
2. A shift in focus from individual to collaborative creativity has lead to a demand for new technology and tools supporting collaborative creativity (Sundholm et al., 2004): *“Much effort has been dedicated in the past to the support of creativity as an individual process”* (Divitini et al, 2004), such as the work done by Massetti (1996) using IdeaFisher. *“The number of applications that look at creativity as a cooperative process...is more limited...”* (Divitini et al., 2004).
3. *“Information technologies have reached a level of sophistication, maturity, cost-effectiveness, and distribution that they are not restricted only to enhancing productivity, but they also open up new creative possibilities”* (National-Research-Council, 2003). The development of computer technologies have lead to new and promising tools suitable for collaboration and creativity, especially in the field of ubiquitous and mobile technologies (Luff and Heath, 1998; Streitz et al., 1999; Divitini et al., 2004).

When considering computer support for collaborative creativity, it’s quite natural to study computer support within the CSCW domain: Looking at technologies supporting collaboration, and then consider the potential of using such technologies to support collaborative creativity.

One of the reasons why it is interesting to look at CSCW support for collaborative creativity is the development of new lightweight, ubiquitous and mobile technologies. We are as Bellotti and Bly (1996) put it; *“walking away from the desktop-metaphor.”* This change of direction in the field of computer science opens up for many new possibilities: *“Often the proposed solutions are based on the desktop metaphor that limits the adoption of these systems. The emerging of new technologies that are more integrated into the physical environment [ubicomp] and support user’s mobility opens new interesting opportunities”* (Divitini et al, 2004). Divitini et al. (2004) believe that *“collaborative systems that are lightweight and mobile can be less disruptive than traditional desktop applications. In particular, the new paradigms of ubiquitous computing can support a beneficial shift of perspective.”* My focus will therefore be the merge of CSCW with ubiquitous and mobile technologies – studying the possibilities of using such technologies to support co-present collaborative creativity.

### 2.1.2 Understanding collaborative creativity

*“The convergence and fast increasing capability of ICT, media and communication opens up for richer support to creativity in team work. A warning is however in order. The condition of flow that is at the basis of creativity is very different from the intellectual, conscious and logical state of mind that is normally presumed when people are working with ICT tools. One question is therefore **how to support a creative process by means of ICT tools without interfering with the deep nature of the process**”* (Divitini et al, 2004). As defined in the introduction, flow is an important component in order to enable and support creativity.



Csikszentmihalyi's description and notion of flow is quite new within the creative domain and especially in connection to collaborative creativity. One important aspect to explore in this thesis is therefore the deep nature of the process. Collaborative creative work needs to be defined in order to find out how ICT tools can support it.

### 2.1.3 My research focus

*"Given the current state of the art we believe that there is a need to define a research agenda in the field [CSCW support for creativity], one that can be drawn by acknowledging the complexity of creative processes and rejecting the idea that team creativity can be supported by tools that require people to sit alone in front of a computer. "* (Divitini et al., 2004)

Most research within computer support for creativity has until recently focused on individual creativity (Williams and Yang, 1999). There has been a shift in focus towards collaborative creativity. This shift demands a new set of models, frameworks and requirements in order to develop or find suitable tools supporting it (Sundholm et al., 2004). My focus in this thesis will be on **computer technology supporting co-present collaborative creativity**. The objective is to define a conceptual framework and a guideline for the design and introduction of computer based tools in collaborative creativity. Related work and technologies in the merge of CSCW, ubiquitous and mobile technologies will be discussed and considered tested due to their promising relevance in collaborative and creative work.

This thesis is in the intersection of two domains: Computer science and creativity. Within computer science the focus will be on CSCW, groupware, ubiquitous and mobile technologies. Within creativity the focus will be on co-present collaborative creativity including creative flow. It will be a study of three intertwined components as presented in the model below:

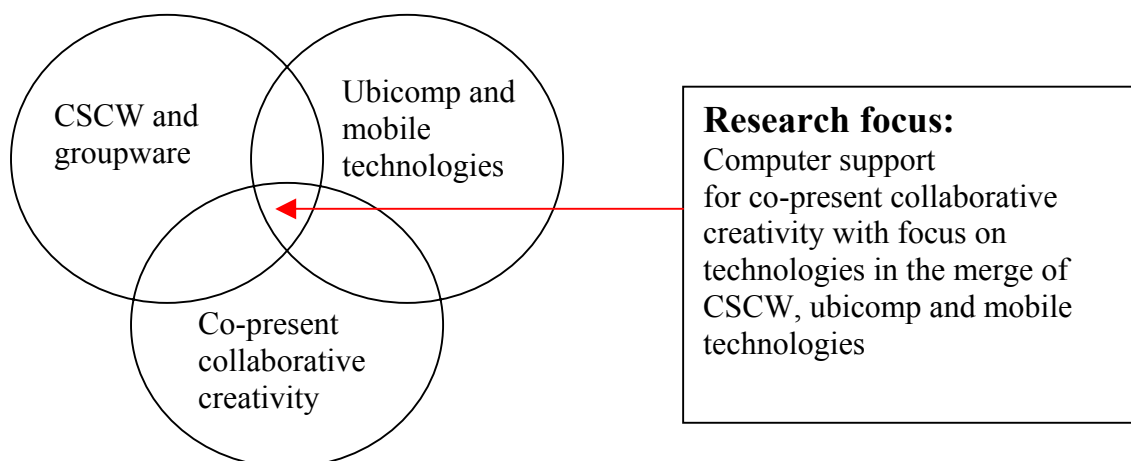


Figure 3 Research focus in this thesis

## 2.2 Research questions

My main research question (MRQ) is:

- *How can computer technologies in the merge of CSCW, ubicomp and mobile technologies support co-present collaborative creativity?*

The objective of the thesis is to establish a descriptive framework and a guideline for designing and introducing computer-based tools for collaborative creativity. The main focus will therefore be to study and identify which elements are involved in co-present collaborative creativity in order to establish a set of requirements and implications for designing and introducing technology in such settings.

In the following text, for the sake of simplicity, I will refer to the term computer support, ICT or just technology. But the focus of the thesis will be on CSCW and groupware technologies that are ubiquitous and mobile.

In order to define a framework and a guideline for the design and introduction of computer tools supporting co-present collaborative creativity, one must:

- Clarify which elements are constituting collaborative creativity: Identify which mechanisms are used to enable and support collaborative creativity, and especially which tools are used and for which purposes.
- Clarify the structure of the creative work and identify which tasks and parts of the creative work would be suitable for technology support.
- Identify possible gains by using technology – what are the goals?
- Identify which type of technology and tools that could be appropriate by clarifying requirements and premises given by the creative work
- Clarify how to introduce and deploy technology in the creative work
- Clarify how people communicate and share information in order to get a better understanding of the way they collaborate, and how groupware technologies can support this type of collaboration.

The main research question (MRQ) is divided into a set of related research questions (RQ):

RQ1: Which elements constitute collaborative creativity? And how are they related?

RQ2: How is the creative work structured?

RQ3: Which tasks or parts of the creative work might be suitable for technology support?

RQ4: How is information shared?

RQ5: How can technology be introduced or deployed in the creative work?

RQ6: Which gains does technology support give?

RQ7: What implications does collaborative creativity have for the choice of technology?  
What are the requirements?

RQ8: Which tools are suitable for supporting collaborative creativity?

## 2.3 Research structure

The study is bisected into:

- A study of co-present collaborative creativity in order to define which elements it consists of, and possibly define how to introduce and use ICT.
- A study of tools for augmenting creativity ‘in practice’: Testing out a selection of tools to get a better understanding of the potential in using ICT tools to support creativity, and to clarify requirements and implications for the design and introduction of such tools.

The studies will result in:

- A conceptual framework for co-present collaborative creativity.
- A guideline for development of tools supporting collaborative creativity: An overview of requirements and implications, a discussion of which tasks or parts of the creative work is worth supporting. and a set of scenarios showing how tools that can be used; for which purposes and tasks.

In order to answer the research questions I will study a case where co-present collaborative creativity is implemented and practiced. The case of choice, an idea laboratory, is described in chapter 4.

An overview of the thesis; which chapters answers which research questions, is given in the figure presented below:

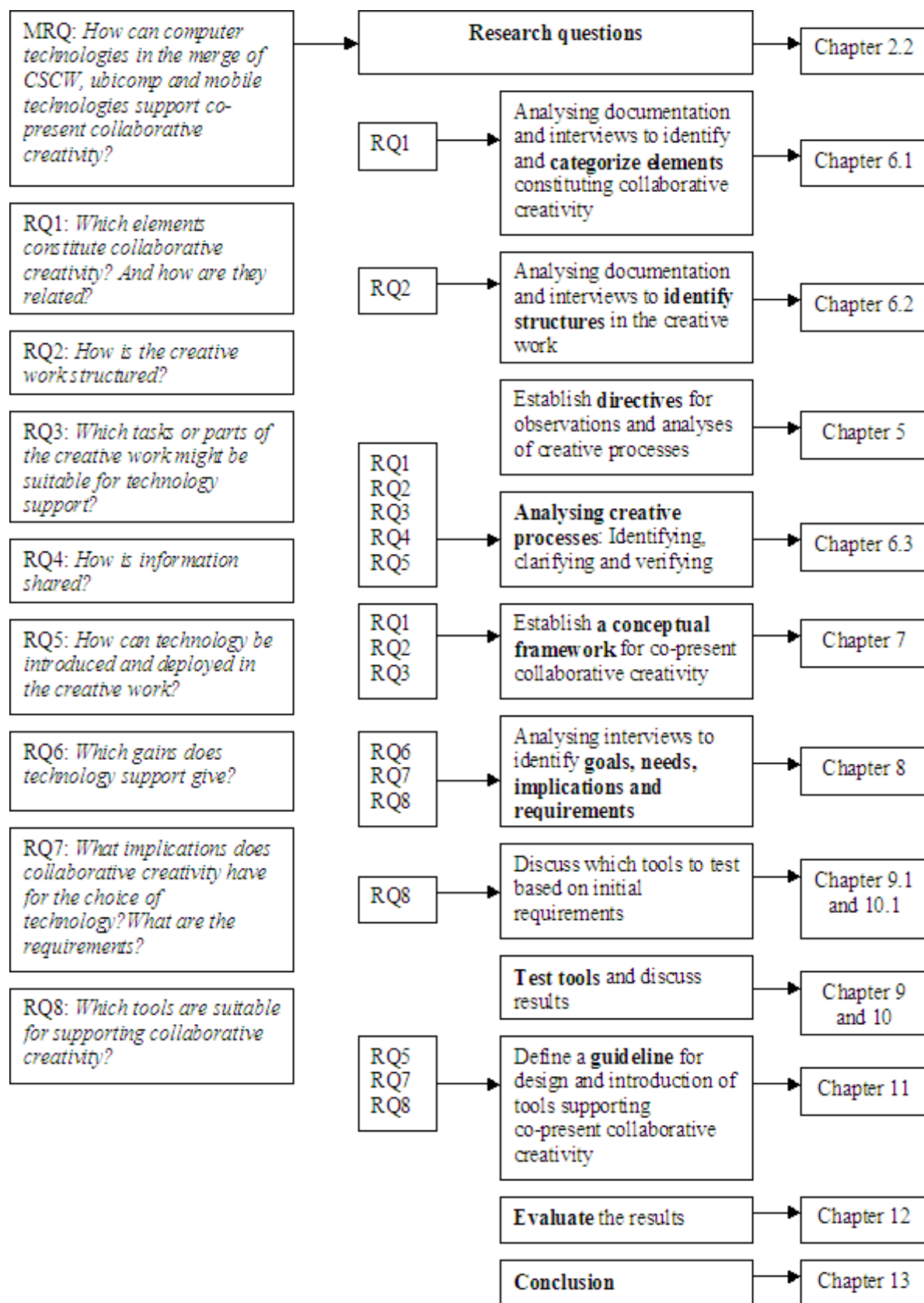


Figure 4 Research structure

## 3 Related work and relevant technologies

### 3.1 Framework for introducing technology in creative work

As mentioned in the introduction, there has been a lot of research on creative processes. A great deal of models and frameworks have been proposed, but few frameworks seem to have addressed the question of how to introduce or implement technology support in creative work. Schneiderman's collect-relate-create-donate framework (2002) seems to be the first framework for creative work which focuses on building a framework in order to implement technology.

Schneiderman (2002) claims that there is a need to define "*a clearer set of requirements*" in order to introduce technology in creative work, and that the natural starting point is "*to identify the users and types of activities to be addressed.*"

Schneiderman's definition (2002) of the users is "*innovative scientists, doctors, lawyers, musicians, artists, teachers, or other knowledge workers who struggle with problems in recognized domains of work [physics, medicine, law, music]*". As mentioned in the introduction, there has been a shift in focus from individual to system-views to a collaborative view on creativity. Schneiderman's definition of the user seems to fit with a systems-view where individuals are doing creative thinking and consults with other experts, and with the traditional individual focus within human-computer interaction (HCI).

This view on creativity and the focus on the individual differ very much from the focus in this thesis, but this is not the focus of Schneiderman's work. Schneiderman's contribution and major focus in his framework have been the definition and descriptions of what user activities need to be supported. His framework consists of four main activities constituting creative work:

**Collect** is usually the first activity in creative work where one "*learn from previous works stored in libraries, the Web and other sources*" (Schneiderman, 2002).

**Relate** involves consulting with peers and mentors. This activity can be done both at early, middle and late stages.

**Create** is referred to as the activity where one explore, compose and evaluate possible solutions.

**Donate** is described as the activity where one disseminate the results and contribute to libraries, the Web and other sources.

A visualization of the four activities is given in the model presented below:

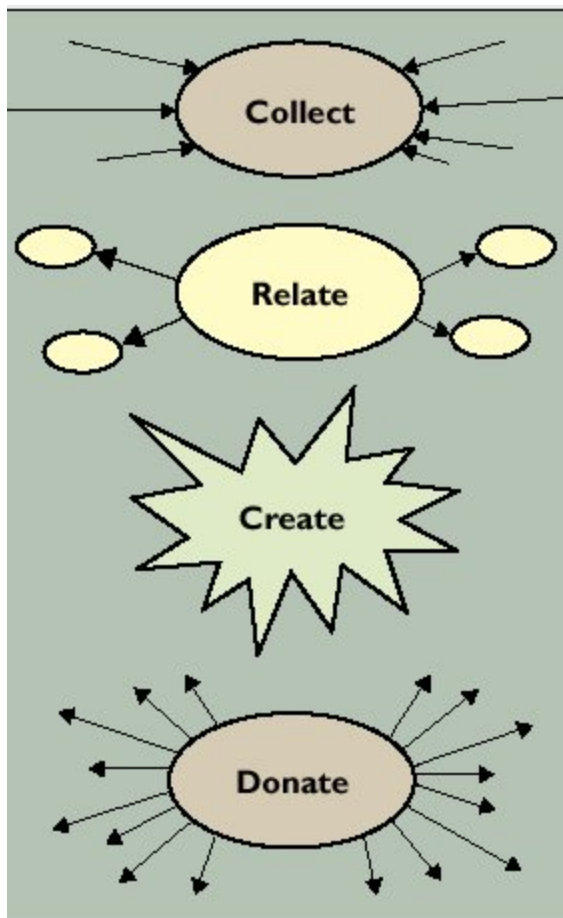


Figure 5 The collect-relate-create-donate framework (Schneiderman, 2002)

The activities do not follow a linear sequence, but can be revisited many times during creative work. *“Creative work may require a return to earlier phases and much iteration”* (Schneiderman, 2002). For instance, one might collect material at an early stage, but might also need to collect more material at a later stage.

The four activities described above is Schneiderman’s elaboration of the creative process. They are quite abstract as a guideline for designing software supporting creativity. Schneiderman has therefore decomposed the four activities into eight concrete tasks and describes in more detail how software can be used to support the four overall activities:

(1) <b>Searching</b> and browsing digital libraries, the Web, and other resources
(2) <b>Visualizing</b> data and processes to understand and discover relationships
(3) <b>Consulting</b> with peers and mentors for intellectual and emotional support
(4) <b>Thinking</b> by free associations to make new combinations of ideas
(5) <b>Exploring</b> solutions—What-if tools and simulation models
(6) <b>Composing</b> artifacts and performances step-by-step
(7) <b>Reviewing</b> and replaying session histories to support reflection
(8) <b>Disseminating</b> results to gain recognition and add to the searchable resources

Figure 6 Eight tasks in the collect-relate-create-donate framework (Schneiderman, 2002)

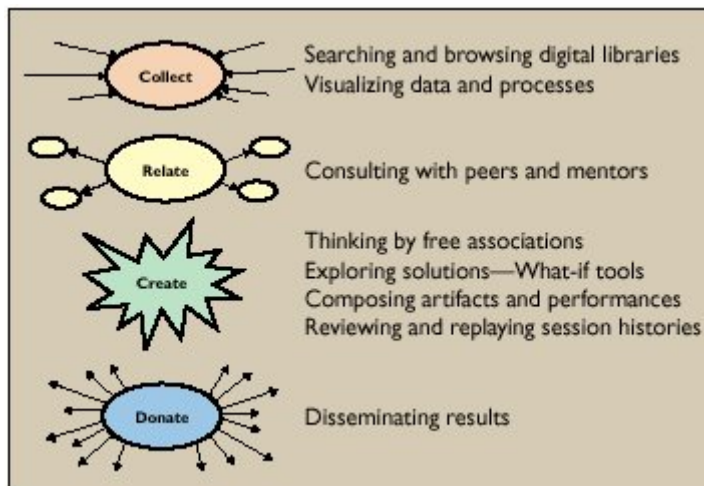


Figure 7 Visualization of how the tasks and the activities are related (Schneiderman, 2002)

Part of my contribution in this thesis will be to define a descriptive framework for understanding co-present collaborative creativity in order to design and implement computer tools supporting creative work. My work differs from the work of Schneiderman in the way that:

- Schneiderman’s focus in his framework is software tools supporting creative work (2002), not considering both hardware and software, as I do in this thesis.
- Schneiderman’s domain of study is human-computer interaction (HCI): The study of the interaction between people and computers with the main focus on hardware and software interface design [6]. The focus in this thesis is on CSCW and groupware, not purely HCI.
- This thesis focuses on co-present collaborative creativity, not just creativity in general or the systems-view as Schneiderman seems to focus on.

Despite these differences, Schneiderman’s framework seems to be the most relevant and related work done, considering frameworks for computer support for creativity. Schneiderman (2002) himself states that his framework is not perfect, but that it “*may be helpful in analyzing existing software and in designing new tools.*” It is therefore interesting to discuss the collect-relate-create-donate framework in connection to the results from my observation and analyses, as presented in the 3C framework in chapter 7.

Schneiderman also recognizes a set of software and interface requirements in order to support creative work (2002):

- Using multiple creativity support tools will be more effective than using one single tool for all tasks.
- It’s important to ensure a smooth integration across different tools and a smooth coordination across windows.
- Compatible action patterns and consistent terminology is needed: Software and interfaces should be built on a suitable action pattern. In other words; the conceptual model used should represent the action taking place. For instance action patterns like ‘annotate-consult-revise’ or ‘open-save-close’.

These requirements will be discussed and compared to the requirements based on the results from observation and analyses, as described in the guideline in chapter 11.

## 3.2 Related work on computer support for collaborative creativity

My research in this thesis will, as initially described, focus on computer-support for co-present collaborative creativity where the combination of the following four components is essential:

- **Computer technology** with focus on CSCW, groupware, ubiquitous and mobile technologies
- Group **collaboration** (and not just cooperation)
- Creativity with focus on **collaborative creativity and creative flow**
- Physically **co-present** collaboration with face-to-face interaction

This combination of components seems non-existing in current research and literature. Many have studied computer support for creativity, but no one seems to have considered all four components. Many, such as GroupSystems [14], Mind Manager [15] and Nesta's virtual worlds (Facer and Williamson, 2004) is still within the desktop-metaphor, only focusing on cooperative software, not considering new interaction possibilities or elements such as creative flow.

The studies most relevant for this thesis seem to be the work of Streitz and fellow researchers at the Ambiente research center and the Fraunhofer-IPSI research institute in Germany. Streitz et al. (1999) conducted one of the first studies on computer support for collaborative creativity, and developed i-Land; "*an interactive landscape for creativity and innovation.*"

There has been a lot of research in the field of shared displays and electronic whiteboards, but most relevant for this thesis is the development of i-Land (Streitz et al., 1999) and Roomware (Prante, Magerkurth and Streitz, 2002; Streitz et al., 2002), and the studies prior to these developments. Streitz et al. (1999, 2002) seem to be the first to study and develop shared displays integrated in the environment – developing shared displays within the ubicomp-frame. The focus is not on single computer-displays, such as using one electronic whiteboard for a meeting, but on using multiple devices integrated in the physical environment.

i-Land is an "*interactive landscape for creativity and innovation*" where information technologies are integrated in the architectural space (Streitz et al., 1999). i-Land consists of several "*roomware components*"; computer-augmented tools integrated in room elements: "*An interactive electronic wall, an interactive table, two computer-enhanced chairs*" connected by common software and technological infrastructures (Streitz et al., 1999).

Roomware is the second generation of i-Land where previous roomware components (DynaWall, InteracTable, CommChairs) and software (BEACH) have been redesigned, and new components (ConnecTable) and software (PalmBeach, MagNets) have been added (Streitz et al., 2002).



Figure 8 The first vision of i-Land (Streitz et al., 1999)



Another recent study and development of an interactive landscape supporting creative collaboration is i-Lounge from the Royal Institute of Technology in Stockholm (Sundholm et al., 2004). There are other recent attempts in developing interactive displays and landscapes, but no one seems to focus on creativity. Examples are iRoom from Stanford University (Johanson, Fox and Winograd, 2002) and Easy Living from Microsoft (Brummit et al., 2000).

My critique of current research in the field of interactive displays and landscapes is that they seem to focus mainly on the technological possibilities, leaving creativity as a secondary focus or an adherent bonus. Articles or studies within computer support for creativity lack a detailed description of how they view creativity, which creative elements they find important, and which creative elements they are trying to support.

Streitz et al. (1999, 2002) and Prante et al. (2002) have, however, conducted very interesting studies prior to the development of i-Land and Roomware defining implications and requirements for computer tools supporting collaborative creativity:

Studies prior to the development of i-Land included an empirical requirements study informing the design of i-Land (Streitz et al., 1999). The study asked so-called creative teams about their current work practices and their expectations about future work environments, which resulted in the following implications and requirements:

- A large room is required, including a flexible setup and mobile components allowing different configurations. The furniture should be multifunctional and flexible.
- There is a need for computer support for:
  - Information gathering while preparing meetings
  - Supporting a wide range of creativity techniques where the computer-based version should allow for flexible configuration or tailoring of underlying rules
  - Support different presentations styles deviating from traditional settings and involving participants in an active manner, so-called ‘participatory presentation’
  - Support for visualizations inspiring and enhancing the creative process
  - Support for communicating other than through visualization; e.g. acoustic, tactile
  - Documenting meetings
- Personal presence is essential for creating a stimulating and productive atmosphere
- The computer should stay in the background: *“We have the creative potential, not the computers.”*

After developing i-Land, Streitz et al. (2002) conducted further studies prior to the development of Roomware. One of the studies evaluated how software designed for supporting creativity actually affects creativity in co-present groups (Prante et al., 2002). The study performed tests where creativity support was measured by counting the number of ideas and how well the software enabled and supported structuring of ideas. The results were three requirements for “CSCW tools to support idea finding in co-located groups” (Prante et al., 2002):

1. Prevention of turn-taking:

There is a dramatic decrease in performance of a turn-taking work mode within idea generation and brainstorming. Turn-taking is blocking the production of ideas. The first requirement is therefore to support synchronous work by enabling multi-user or parallel input.

2. Structuring of the idea space:

A structuring of the shared space of ideas seems to foster the group's creative performance: Structuring the ideas seems to have a positive effect on the incubational stage of idea finding.

3. No process constraints:

There seems to be no use of structuring the tools to fit a fixed set of phases. The results show a rather chaotic pattern of actions that followed the initial flow of ideas, which should not be shaped by process constraints.

My research in this thesis will start with a thorough exploration of collaborative creativity in order to find out which elements it consists of, and which elements can be supported or even enhanced by the use of computer technology. The approach differs from the work of Streitz et al. (1999, 2002) in the way that my starting point is creativity, whereas Streitz's starting points seems to be the technology.

The requirements and implications identified in the work of Streitz et al. (1999) and Prante et al. (2002) will be compared to the implications and requirements identified through interviews, observations and analyses in this thesis, which will be part of the guideline in chapter 11.

### **3.3 Relevant technologies in the merge of CSCW and ubicomp**

Ubiquitous and mobile technologies have mainly focused on the development and research on technology-driven aspects such as infrastructure, networks and architecture, with an increased interest for interface design of hardware and software (Streitz et al., 1999). Much of the focus within ubicomp has been on location-awareness and the focus within mobile technologies has been on developing physically small devices (Johnson, 1998). The evolution of these technologies has now reached a sophisticated level where the infrastructure and the hardware are starting to fall in place, and the focus has shifted towards interface design and usage areas (Luff, Heath, Norrie, Signer and Herdman, 2004, Schneiderman, 2002). That has led to an increased interest for such technologies within the CSCW domain (Luff et al., 2004).

Ubiquitous and mobile technologies have shown to be quite promising in supporting collaboration. A lot of the research in the merge of CSCW and ubicomp has focused on the development and use of shared displays. There is also an increasingly interest in mobile technologies and especially in the merge of ubiquitous, mobile and tangible artifacts, such as the research on PDAs and digital pens.

This thesis will focus on technologies in the merge of CSCW, ubicomp and mobile technologies. The focus will be on both hardware and software; the interface people must interact with in order to perform a task. It will look at technologies where the interface is “invisible”, where people can focus on the task and not the tool, and at tools that enables people to move around.

My objective is to define collaborative creativity in order to establish a framework and a guideline for designing and introducing computer technologies in creative work, including a list of requirements for designing computer technologies supporting co-present collaborative creativity. A set of tests will be conducted in order to verify and exemplify these requirements, and to show how computer tools can be introduced and deployed in creative work. The following three types of technologies have caught my interest due to their positive results within co-present collaboration, and their promising results and relevance within the creative domain. The tools will be considered tested if they fit the requirements.

#### **3.3.1 Shared displays**

*“One major focus of groupware development has been the creation of virtual ‘shared workspaces’ in distributed computer environments”* (Ishii, 1999). The focus on shared displays has continued even though there has been a shift in focus from distributed teams to co-located teams. *“One of the most promising technologies in order to support collaboration in co-located teams seems to be electronic whiteboards”* (Pedersen, McCall, Moran and Halsz, 1993). Stewart, Bederson and Druin (1999) claim that possible benefits of using shared displays in co-present collaboration is that they might make sharing easier, enrich the existing collaboration, make communication more democratic, and reduce conflicts. Stewart et al. (1999) suggest creativity and learning as two domains particularly suitable for introducing shared displays in order to support group activities. Shared displays will be kept in mind as a potentially interesting technology supporting collaborative creativity.

### **3.3.2 Digital pens**

Digital pens are another promising technology within ubiquitous and mobile technologies. Research have not focused on digital pens as a single device, but in connection with other technologies like electronic whiteboards (Pedersen et al., 1993), tablet PCs, mobile phones and PDAs [11][12]. Anoto, Nokia, Logitech and others have however created a more solitary digital pen connected two a new product; digital paper [13]. These pens enable regular writing with ink on paper, plus a whole range of new possibilities when uploading the writing digitally to either PCs or mobile phones. Then, the digital software enables transfer, sharing, visualization and editing possibilities.

The usage of digital pens and pen based computing have shown promising results due to the fact that they support freehand writing and drawing, which is prevalent in small group interactions (Pedersen et al., 1993). This form of interaction is considered more appropriate within the ubicomp-metaphor because it is a kind of unselfconscious and natural way of interacting (Pedersen et al., 1993), as opposite to using keyboard and mouse as input-devices and interaction forms. Digital pens are therefore considered a promising technological interaction device for collaboration in small groups, and it would be interesting to test it in a creative setting.

### **3.3.3 Handheld computers**

As mentioned, digital pens are often used in connection with handheld computers, such as PDAs. The main advantage of handheld computers is of course that they are portable and mobile: They offer great communication and information transfer possibilities. These advantages have mainly encouraged personal rather than collaborative use, but some, such as Inkpen et al. (2002), have focused their study on using handheld technology to support face-to-face collaboration. The work of Inkpen et al. (2002) showed that handheld computers have limitations concerning screen size, but states that they give a positive contribution to collaboration when connected to other devices. It would therefore be interesting to consider such technologies in supporting collaborative creativity – studying how they impact creativity, and not just collaboration.

## 4 Case – Oasen

### 4.1 About Oasen

Oasen is an idea and innovation laboratory at NTNU. It was established in 1999 with funding from Næringslivets Idefond [10], and works as a facility and research laboratory for creative projects in industry, research and education.

Oasen describe themselves as *“the place for everyone who want or need to be creative in their problem solving”* [1]. They organize and facilitate creative processes to help customers with problem solving or idea generation. They see creativity as *“the ability to solve problems in new and exciting ways”* where the objectives are to *“help develop knowledge and skills on facilitation of creative group processes. And also to transfer this knowledge to the business and industry and to the university itself through courses, seminars and teamwork sessions.”* [1]



Figure 9 Picture of the creative room at Oasen, NTNU

Oasen plan and facilitate creative team session which they call creative processes. Most sessions take place at their facilities at NTNU Gløshaugen. The traditional work environment is replaced with *“white sheets, color pencils, African drums, clay, tiger slippers and lots of other weird things”* [1]. Their understanding of creativity and their creative work will be explained in more detail in section 4.2.

In the last four years Oasen has conducted more than 90 creative work sessions and creative courses. Their customers are diverse and have very different needs. Some want a short glimpse of what creative work-methods are all about while others want creative support within product- or organizational development [A].

For more information about Oasen, see <http://www.idefondet.ntnu.no/oasen.htm>.

## 4.2 Oasen's definition and understanding of creativity

Oasen define creativity as “*the ability to solve problems in new and untried ways*” [1]. Oasen's understanding and implementation of creativity strongly emphasizes two elements: *collaboration* and *creative flow* [A, B, Appendix 15.2]. They base their work on helping and supporting creative work in groups, and strongly believe that creative flow is one of the most important components in creativity.

Oasen have a strong emphasis and focus on flow as defined by Csikszentmihalyi (1996). They believe that in order to be creative one must be inspired to be so, where both the environment and the process must stimulate and support creative flow [Appendix 15.2]. That is why they have put a lot of effort in designing their own physical space enabling stimulation through physical movement, and tactile stimulation by the use of odd looking artifacts and colors.

Oasen focus on what Sundholm et al. (2004) calls *collaborative creativity*. Individuals are stimulated to ‘think different’, share their ideas with others, and then continue to build on each others ideas. This doesn't mean that Oasen solely supports and acts on collaborative creativity. In order to share something, one must have something to share. Oasen therefore supports both individual creativity – stimulating the individual to think creative thoughts, and then supports communication and information sharing in order to support collaborative creativity in groups – individuals share their ideas, and new ideas arise based on inspiration from others.

Oasen's understanding of creativity is implemented and practiced through creative methods and creative processes, as described in the sections below.

### 4.2.1 The creative processes

Oasen's definition of a creative process goes beyond the theoretical definitions mentioned in section 2.1. They talk about creative process as the actual implementation and facilitation of creative thinking and collaborative creativity in groups – the sessions which they plan and conduct in their idea laboratory at NTNU.

The goal or the intentions behind the creative process is to help others with creative thinking. Oasen conduct creative processes in order to help groups and organizations with [A]:

- Training people in creative thinking and creative methods
- Creative problem solving
- Product development
- Teambuilding
- Developing creative workspaces and settings

The facilitators defined a creative process and creativity by the following criteria:

- The process should lead to a *new product* or have a new solution that is *valuable* in some way.
- The process should be experienced as triggering or releasing for those participating: *Each person's potential should be realized*. You should feel a greater use of your own potential than what's normal in other ways of working.

- Participants should experience the process in a positive way: It is supposed to be fun, comfortable and *a pleasant experience*.
- The process should lead to some kind of *learning*:
  - Participants learn from the process itself – creative thinking and methods
  - Participants learn from what they create
- The process can focus on or indirectly *build positive relations between people* – it can strengthen a team. The group as a social system should be stronger as a result of the process.

The creative process is a complex combination of elements interacting with each other [Appendix 15.2]. Two of the most essential parts emphasized is the facilitator and creative methods [A, B], which is explained in the sections below. Which other elements are included in a creative process and the creative work at Oasen will be further studied and described in the analysis in chapter 6.

### 4.2.2 The facilitator

The work of planning and conducting creative processes is performed by five facilitators working at Oasen [A]. A facilitator is the person who plans and conducts the creative processes: Meaning someone who skillfully helps the groups in the creative work, assisting them in the process of creating. Helping them keep track of time and tasks, helping them reach a consensus and a result, and not as the actual producer of results.

### 4.2.3 Creative methods

Creative methods are what many in literature defines as creativity techniques [6]. It is heuristic methods and techniques used in order to facilitate and stimulate both individual and/or collaborative creativity. Examples from literature are mainly techniques used in order to enable and support brainstorming or idea generation [6].

Oasen develop their own methods and techniques based on existing ones, special customer or task-specific needs, and personal experiences from creative work and creative processes [A, B, Appendix 15.2]. Examples of methods mentioned are [A]: “*Sidespor*” where the goal is to break conventional thinking and patterns by solving different tasks in a different setting than what they normally belong in. “*Talking-stick*” where each group member is allotted a short time to present their ideas. And “*Askeladden*” where the use of artifacts and symbols is meant to stimulate associations.

### 4.3 Why Oasen?

Oasen was chosen as the case for this thesis based on the following criteria:

- Oasen's understanding of creativity and their creative work is original and quite unique: They focus on collaborative creativity where the groups are physically present face-to-face, and they strongly emphasize the notion of flow. They also believe in teaching, learning and training people's creative abilities. And they believe in ICT as a potential tool for supporting creativity. Not many others seem to have such an understanding of creativity, and certainly not an implementation that fulfills all of these points.
- Oasen was interested in cooperation with the Department of Computer and Information Science (IDI) in order to explore the use of ICT support in their creative work. The cooperation started with an initial meeting in January 2004, and this thesis is part of the results so far.
- Oasen was per 2004 not using any computer technologies as part of their creative work. They see the need for digital technologies in order to enrich, enlarge and support their work. The gains of introducing technology are many, and Oasen is very open for new suggestions.



## **5 Research method**

Method is a systematic way of exploring reality; a way of gathering, organizing, processing, analyzing and interpreting social facts so systematically that others can re-examine the results. The choice of research method should be closely connected to your theme and research questions [2]. Cooperation technology and creativity is a topic I know little about beforehand. My research questions mainly consist of ‘what’, ‘how’ and ‘why’. I seek an understanding of a phenomenon, and not a quantification of numbers. It is therefore natural to choose a qualitative approach since it’s most suitable in research where the researcher have little knowledge about the phenomenon or the domain of investigation [2].

### **5.1 Theoretical and empirical basis**

The thesis is both theoretically and empirically based. The theoretical base includes theoretical views and research within the creative domain and related work in the field of computer support for creative work. The empirical evaluation includes a case study of Oasen, an idea laboratory at the Norwegian University of Science and Technology (NTNU). The main results in the thesis as presented in chapter 7 and chapter 11 are empirical results generalized when compared to theoretical views in related work.

Existing literature was reviewed in order to find related work with interesting findings concerning design and introduction of computer based tools in creative work. Relevant work and technologies are discussed in chapter 3 and then further verified or clarified when compared to results from empirical studies in the case.

### **5.2 Description of the case study**

The empirical case study involved the following steps and activities:

- 1) An analysis of formal documentation as described in section 5.2.1.
- 2) Interviews with facilitators as described in section 5.2.2.
- 3) Observation and analyses of creative processes, as described in section 5.2.3., including directives for observation of the processes in section 5.2.3.1.
- 4) Testing of ICT tools, as described in section 5.2.4.

An overview of collected data material is presented in the table in section 5.2.5.

#### **5.2.1 Analysis of formal documentation**

An analysis of formal documentation was conducted in order to identify elements and structures in collaborative creativity, which then was used to establish a set of directives for observation and analyses of creative processes. The analysis also provided a better understanding of the case and their work, and resulted in an initial study of elements in collaborative creativity, which was later used to define the framework in chapter 7.

## **5.2.2 Interviews with facilitators**

The interviews were conducted in order to gather information about two aspects:

- Background information about Oasen – the idea laboratory; When it started and why? Who works there? How do they view and define creativity? How is the work organized? And so on.
- ICT in Oasen: What's status quo? Why do they want ICT tools? What are their wishes and needs when introducing new technology? Which challenges and potential problems do they recognize?

Interviews with facilitators provided more background information about Oasen than written in the formal documentation, which then could be used to verify or clarify the results from the initial analysis of elements and structures in collaborative creativity. The interviews were however mainly conducted in order to identify needs, goals and expectations to ICT tools in creative work and to identify a set of requirements and implications for the design and introduction of such tools.

The interviews were to be more like a dialogue instead of accurately following a predefined set of questions. I wanted to do so-called open interviews (Gansmo, 1999) where the sources speak freely about their thoughts around the issues addressed. In order to get them started and get them to talk about the issues I was interested in, I made an interview guide with a few main questions with some follow-ups, as presented in Appendix 15.1.

### **5.2.2.1 Interviewees**

It was very natural to choose the facilitators at Oasen as the interviewees since they are the initiative-takers and the driving force behind the laboratory. It was them who initiated the laboratory and who has developed Oasen to what it is today: They plan and run the creative processes. It is them who have defined Oasen's view on creativity and developed methods and techniques to support this view. And it will eventually be them who introduce and use technology in Oasen.

The facilitators were contacted by e-mail and asked to participate in one hour interviews. Three out of five responded positively. Luckily, these three were the ones that represented the greatest multiplicity considering their background, subjects of interest, sex and age. They represent a large part of the knowledge, experiences and interests founded in the interdisciplinary team of facilitators and partners connected to Oasen.

### **5.2.2.2 Conducting the interviews**

One of the interviewees was interviewed in his office due to practical reasons. The others were conducted in Oasen. The motives behind were that the interviewees should feel comfortable in familiar spaces, and that it would be easier for them to refer to the surroundings and show what they were talking about. The interviews went well, and the interviewees that were interviewed in Oasen exemplified a lot by referring to artifacts and tools in the surroundings.

Two out of three interviews were documented using a video recorder. The third one was documented using a tape recorder due to the lack of available video equipment. Such tools can affect the interviewees' behavior and feedback in different ways (Cosby, 2003). Many experience video recordings as frightening (Cosby, 2003), and balk at explaining the complete picture or the naked truth. In this case it didn't seem to be a problem since the facilitators are

quite used to document their work either by video recordings or by taking digital pictures. The subject and the questions asked are also quite impersonal, and the recordings are not distributed. The interviewees were asked if it was ok to use video or tape recorders to document the interviews. They were asked both by e-mail, when they initially were asked to participate in the interviews, and before the actual interviews took place. And they were all ok with it.

### **5.2.2.3 Transcription of interviews**

All interviews were transcribed shortly after each interview while things were still fresh in memory.

All of the transcribed material was normalized , meaning that I translated from dialect to one of the Norwegian literary languages [bokmål]. On the whole, the interviews were transcribed word-by-word, and with notations for pauses, laughter, gestures and similar. Only a few parts of the interviews were left un-transcribed due to the fact that it was chit-chat irrelevant for the thesis. In addition to the transcription of the interviews I also reflected upon the implementation of the interviews and wrote a few notes about the context and personal thoughts. Citations have been freely translated to English and used in chapter 8.

The transcription of the interviews are added in Appendix 15.2.

### 5.2.3 Observation and analyses of creative processes

Observation and analyses of creative processes were conducted in order to verify and clarify the elements and structures identified in the initial analysis, and clarify the relations between them. A secondary objective was to identify possible gains by introducing ICT and possible ways of using ICT in the process, especially which tasks or parts of the process might be suitable for ICT support. Identifying communication patterns and ways of sharing information was done in order to clarify both the structure of the process and identify requirements or implications for design of tools.

A set of directives were established as presented in the figure below. They are based on the research questions defined in section 2.2, and the analysis of formal documentation and interviews as presented in section 6.1 and 6.2. The directives are a guideline to be used when observing and analyzing creative processes in Oasen in order to answer the research questions and establish a structure in the data material.

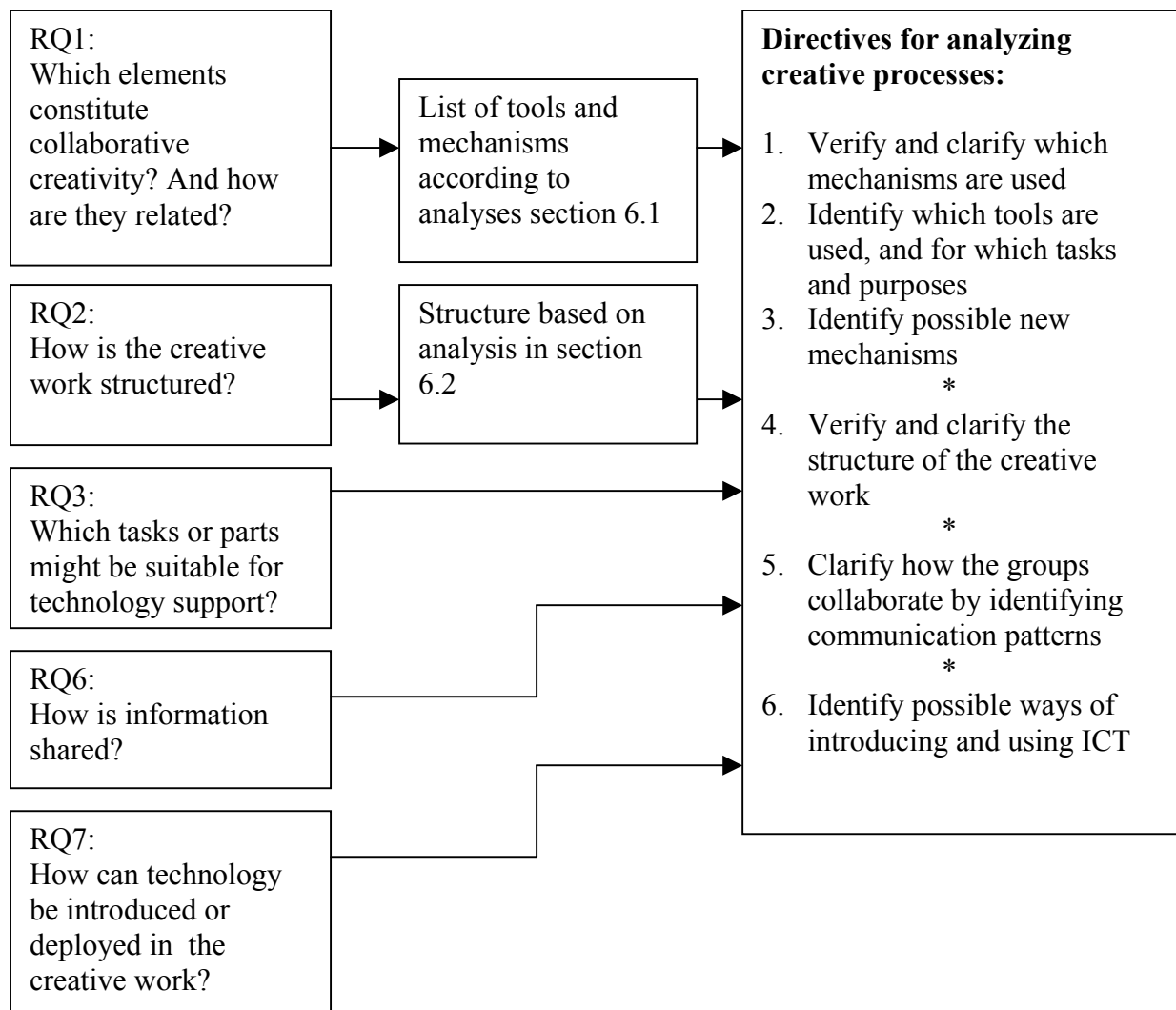


Figure 10 Directives for observing and analyzing creative processes

An overview of creative processes that have been observed and analyzed is presented in the table below:

	<b>1st Meeting</b>	<b>EIT</b>	<b>SINTEF</b>	<b>ISFIT</b>
<b>Documentation:</b>				
Processplan	no	no	no	yes
Personal notes	yes	yes	no	yes
Other people's notes	yes	no	yes	no
Video recordings	no	no	yes	yes
Digital pictures	yes	no	no	yes
<b>Short facts:</b>				
Date	January 2004	January 2004	March 2004	October 2004
# of facilitators	1	1	2	2
# of participants	5	16	14	30
# of groups	1	4	4	5
Length of process - time	2-3 hours	1,5 hour	1 day: 5,5 hour	3,5 hour
<b>My role</b>	participant	observing	analyzing material recorded by others	observing and recording
<b>Type of users/customers</b>	facilitators, students, and researcher	teaching staff at the university	researchers in industry	students
<b>Users familiar with Oasen?</b>	only the facilitators	no	no	a few
<b>Goal/theme</b>	introduction to Oasen and their creative work, discuss introduction of ICT	discuss and agree upon evaluation criteria for the interdisciplinary subject EIT	product development and training in creative thinking	learn about creative methods and reflect upon their role as group leaders during the ISFIT festival
<b>My main focus</b>	getting to know Oasen	the facilitator role	tools and artifacts	information sharing and visualization
<b>Other interesting aspects</b>	how to use ICT in Oasen	participants' adjustments to the setting	the creative process - different stages	creative methods

Table 1 Overview of creative processes that have been observed and analyzed

## 5.2.4 Testing of ICT tools

Testing of ICT tools were conducted in order to verify and clarify gains, needs, requirements and implications identified in interviews and observations, and which tasks were suitable for ICT-support.

The first testing, called IVO1 (IKT Verktøy i Oasen), was conducted in the spring 2004 based on initial requirements identified in the 1<sup>st</sup> meeting process, the EIT-process, the SINTEF-process and the interviews. The objective of this testing was to explore the use of PDAs and electronic whiteboards, verify and clarify requirements and define directions for further studies.

This testing was planned by one of the facilitators at Oasen together with diploma student Ole Sommerin Herbjørnsen. The facilitator conducted the process, while Herbjørnsen documented the process by partly video recording it. Further descriptions is given in the thesis of Herbjørnsen (2004).

My role in IVO1 was as a participant trying out the tools getting first-hand-knowledge on how it was to use the tools solving creative tasks. Personal notes reflecting on the use of tools combined with video recordings and a survey conducted by Herbjørnsen and a process plan provides the data material from this testing. The process plan is added in Appendix 15.5.

The second testing, IVO2, involved the testing of digital pen and paper. The process was planned and conducted by one of the facilitators at Oasen in coordination with a researcher from Studio Apertura at NTNU. My role was as an observer documenting the process by video recordings and digital pictures. The data material from this process consists of video recordings, digital pictures, the process plan, personal notes, notes from an evaluation meeting with the facilitator, results produced in the process and a survey handed out to the participants as part of the last stage of the process.

Survey questions are added in Appendix 15.6 and part of the process plan is added in Appendix 15.7.

## 5.2.5 Overview of the data material

An overview of the data collected and analysed during the case study is presented in the table below:

What	Documentation	My role	When	Focus	Chapter /Section
Oasen's web page		Analysing	January 2004	Background information about Oasen	4 and 6.1
Skaperkraft	Oasen's booklet about their work	Analysing	January 2005	Creative methods and the creative process	4, 6.1 and 6.2
Article	Article about Oasen and their work	Analysing	January 2004-Jan 2005	Oasen's understanding and implementation of creativity	4, 6.1 and 6.2
Interviews with facilitators	Transcriptions of video and tape recordings	Interviewer. and analysing	March 2004	Background information about Oasen, understanding of creativity and their creative work, implications and requirements for introducing ICT, goals and needs	6.1 and 8
1st meeting	Personal notes, other people's notes, digital pictures	Participating in process. and analysing	January 2004	Getting to know Oasen: the setting, the people, the creative work, goals and requirements for introducing ICT	6.3.1
SINTEF process	Video recordings, other people's notes	Analysing recorded material	March 2004	The use of different tools in different groups while solving the same tasks	6.3.2
EIT-process	Personal notes	Observing and analysing	January 2004	The facilitator's role and process structure	6.3.3
ISFIT-process	Video recordings, process plan, personal notes, digital pictures	Observing, recording and analysing	October 2004	Verify my understanding of the creative work in Oasen, with special focus on information sharing and visualization	6.3.4
IVO1 testing	Video recordings, personal notes, other people's notes	Participating in process, observing, and analysing	June 2004	Testing whiteboards and PDAs	9
IVO2 testing	Video recordings, digital pictures, personal notes, process plan, survey, facilitator's reflections	Observing, recording and analysing	February 2005	Testing digital pen and paper	10

Table 2 Overview of the data material





## 6 Analyzing creativity in Oasen

### 6.1 Mechanisms and tools in collaborative creativity

During this section I try to define and categorize which mechanisms and tools are needed in order to enable and support Oasen's understanding of collaborative creativity. This analysis is based on written documentation about Oasen [1, 3, 4, A, B, C] and feedback from facilitators during interviews [Appendix 15.2].

This analysis is conducted in order to

- Get a better understanding of the main elements in collaborative creativity
- Define which mechanisms and tools enables and supports these elements
- Try to categorize the elements, mechanisms and tools in order to get an understanding of the connections and the interplay between them

#### 6.1.1 Main elements and mechanisms

The overall goal is to enable and support collaborative creativity in Oasen. This means supporting what Oasen defines as the main elements of collaborative creativity [1, A, B, section 2.2]:

- Individual idea generation
- Collaboration and information sharing in groups
- Creative flow

In order to support and enable such an understanding of creativity, Oasen focus on the following mechanisms [1, 3, A, B, Appendix 15.2]:

1. A multi-communicative approach including visualization
2. Democratic communication
3. Physical movement
4. Physical setting

Oasen have experienced that a **multi-communicative approach** with strong emphasis on visualization both stimulates creativity by increasing the vigorousness in the idea generation, and by strengthening the communication of ideas or results to others [B]. Supporting individual creativity and strengthening the communication and information sharing with others increases collaborative creativity in groups: New ideas arise based on other people's ideas [B]. A multi-communicative approach means *“using the whole body. Communicating in several ways. Not just with words”* [Appendix 15.2.3], but by using different communication channels and several ways of expressing oneself: Verbally, written text, drawings, pictures, models, metaphors, body language, acting, etc.

One of the most important ways of communicating in Oasen is through **visualization** [Appendix 15.2.3]. Oasen believe that *“using different ways of visualizing ideas can stimulate the creative process even more.”* [B] Visualizing complex issues makes things become clearer, more concise and concrete. As one participant in Oasen once commented: *“I have learned how communication through visual things like pictures and objects help people to understand better.”* [A] Visualization makes it easier for people to communicate and

understand abstract and unfinished ideas, make associations and continue on the chain of thought.

Visualization also helps to support another of Oasen's mechanisms – achieving a **democratic communication** and information sharing in the group. *“When the verbal language alone doesn't dominate the collaboration, then the communication space is more democratic...”* [B] Using several communication forms makes the interaction much more democratic. It's easier for everyone to express their ideas and contribute to the group result. You don't necessarily have to be the most eager or knowledgeable person in order to be heard. The goal is for everyone to contribute. That means that each group gets a larger variety of ideas to build on and to choose from. Emphasizing democratic communication means slightly forcing or making sure that the participants collaborate and share information, and when doing so, making better and more creative results.

Another important mechanism in order to support collaborative creativity in Oasen is **physical movement**: *“Bodily movement in connection to creative processes is one of our basic elements”* [Appendix 15.2.1] Oasen believes that *“there's a complex interplay between the brain and the movements of the body”* [Appendix 15.2.1] and that *“a body in movement will send out more impulses and become more daring.”* [A] And that physical movement therefore *“can stimulate a greater flow of ideas and knowledge.”* [A] The creative methods, the setting and the tools used in Oasen is therefore chosen or used in order to enable physical movement of participants. They try to stimulate people's activity level; using the body to activate one's mental activity. By physical movement they mean; standing, sitting, walking, using body language, acting or demonstrating, etc. Oasen have experienced that using the body clearly affects people's energy level and enthusiasm: *“Energy level and enthusiasm increases significantly when the groups are given the opportunity to build physical models representing their ideas.”* [B]

Closely connected to physical movement of participants is Oasen's emphasis on **the physical setting**. Oasen claims that how the physical room is designed both influences on the atmosphere and the opportunities for interaction and movement [B, Appendix 15.2.3]. *“The room and how you sit. And how you're working also has a lot to say for the results.”* [Appendix 15.2.2]

## 6.1.2 The relations between the main elements and mechanisms

Below is a model showing the connection between the main elements and the mechanisms supporting collaborative creativity in Oasen:

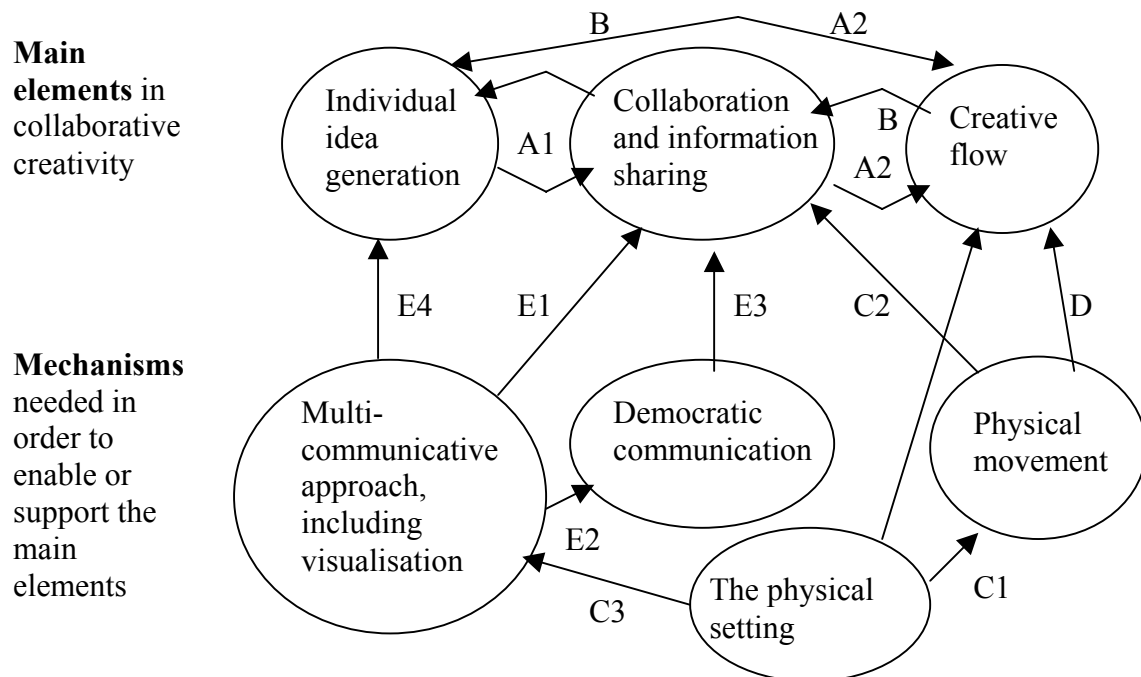


Figure 11 The relations between the main elements and mechanisms

In order to support collaborative creativity, one must also support individual idea generation, and then achieve collaborative creativity through sharing of individual thoughts and ideas (A1). Successive idea generation and collaboration can also increase the creative flow (A2).

Creative flow is an important element in collaborative creativity; it's a state of mind one would like to achieve, and if so will support and enhance both individual idea generation and collaboration (B).

The design of the physical setting affects the way in which people can move around physically (C1), which again influences people's ability to share and collaborate (C2). Using a set of different artifacts made visible and available in the setting also enable and support a multi-communicative approach (C3).

Physical movement seems to be the most effective and supportive element in order to enable creative flow (D). Creative flow is also stimulated through a multi-communicative approach; then through the mind of the individual and through sharing of ideas.

A multi-communicate approach seems to be an important element in order to enable sharing and collaboration (E1). For instance a communicative approach focusing on visualization, which then supports democratic communication (E2), and which again can support sharing and idea generation (E3). A multi-communicative approach also support individual idea generation in the way that it makes it easier to express and conceptualize your ideas and through for instance by stimulating the senses through visualization (E4).

### 6.1.3 Semi-mechanisms

A closer look at the documentation and feedback from the interviews reveals a mid-layer between the main elements and the mechanisms supporting them: Each mechanism mentioned in section 6.1.1. have one or several semi-mechanisms which they try to support in order to support the three main elements. For instance can democratic communication and visualization be used as mechanisms for triggering people's imagination and increasing the number of, or the quality of the ideas that are generated. Another example of the interplay between the main elements, mechanisms and the semi-mechanisms are the fact that Oasen uses physical movement and the physical setting as mechanisms to stimulate the senses and people's energy level in order to enable and support creative flow and idea generation.

The semi-mechanism needed in order to support the main elements of collaborative creativity are [1, 4, B, C, Appendix 15.2]:

- Motivate participants and make them feel comfortable in the setting
- Stimulate people's curiosity, playfulness and spontaneity
- Stimulate people's energy level and enthusiasm
- Stimulate people's senses
- Stimulate people's imagination and association abilities

It is important for Oasen to **motivate** participants and make them **feel comfortable** in the setting [B, Appendix 15.2.3]. They have to get people to trust each other and establish a good atmosphere for communication and collaboration. There's several ways of motivating people. One is to motivate and interest people by making them use their personal or professional abilities [B]. Another is by stimulating their **curiosity and playfulness**. When triggering people's curiosity you might also trigger their motivation to participate and engage.

All of the semi-mechanisms mentioned above are closely connected or intertwined. Stimulating and triggering one mechanism may also stimulate and trigger other mechanisms. As mentioned, stimulating curiosity may also mean stimulating motivation. Just as stimulating **energy level** might include stimulating **playfulness** and **spontaneity**.

Another close connection is between stimulating people's **senses** and their **imagination and association abilities**. Stimulating people's senses is very important to Oasen because they believe that "*activating different senses and the subconsciousness increases the amount of ideas*" [B]. Oasen believe that different tools and mechanisms can help to stimulate the senses and therefore trigger and support creative impulses and subconscious resources.

The semi-mechanisms must be supported in order to enable and support the main elements of collaborate creativity in Oasen: They want participants to be stimulated in order to think and act in creative ways. They want participants to engage in and enjoy collaboration and sharing of information. And in order to do so, Oasen believe in stimulating people's energy level and enthusiasm to achieve a state of 'creative flow'.

## 6.1.4 Tools

The documentation concerning Oasen's work doesn't discuss or describe the use of tools specifically, but mentions some of them, and uses pictures to exemplify or describe. The pictures show that Oasen uses the following tools in their creative work:



Figure 12 Paint, roll of paper, paintbrushes and Lego blocks



Figure 16 Pictures

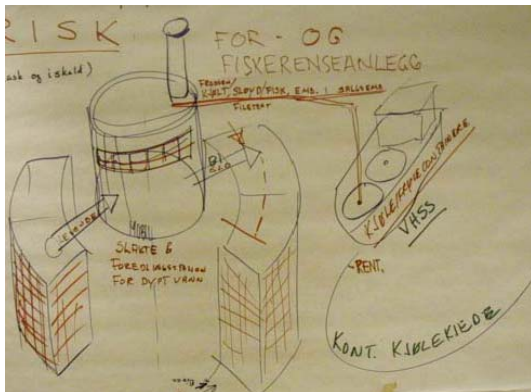


Figure 13 Large posters and color pencils



Figure 14 Odd objects and toys'



Figure 15 A4 sheet of paper with instructions



Figure 17 Models of clay and objects

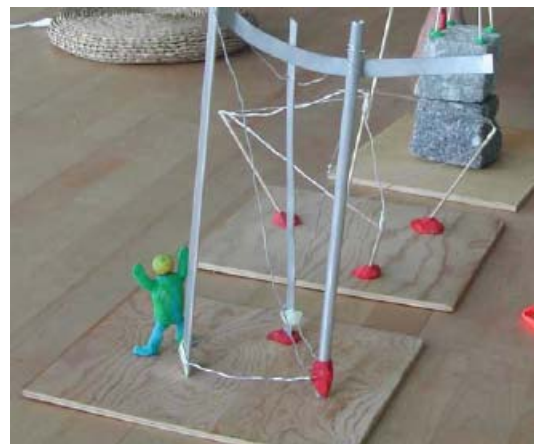


Figure 18 Models and installations built using clay and different objects



Figure 20 Large posters with writing and drawing, and colored post-its with comments



Figure 19 Colored chalk for drawing and writing on blackboard

Feedback from the facilitators during interviews verifies that Oasen uses the tools mentioned above for idea generation, communication and information sharing in creative processes [Appendix 15.2]. The pictures shows that Oasen uses a set of tools that enables multi-communication - using different ways of expressing oneself. And that they use a set of tools that one certainly can imagine as sense-stimulating.

The written documentation does not describe which tools are used for which tasks or supporting which mechanisms. Some pictures, do however give us a general idea of the purposes showing for instance that posters are used when presenting ideas and that blackboards can be used for visualizing when presenting.

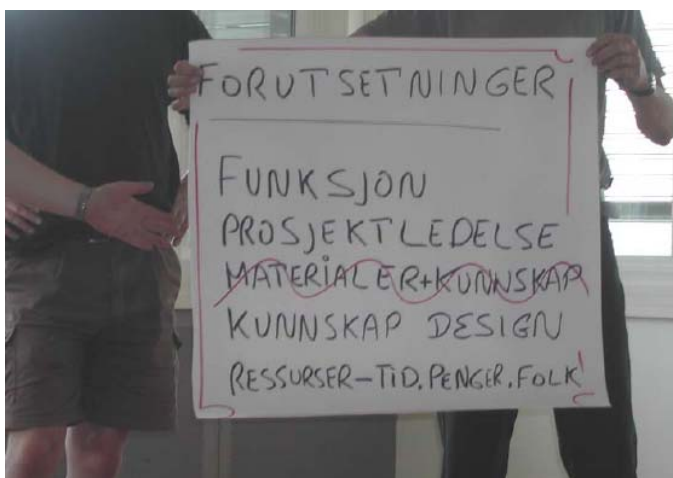


Figure 21 Poster and blackboard used for visualizing when presenting

The facilitators only mentioned tools when exemplifying, and gave very few hints about the purpose of using certain tools. But one of them [Appendix 15.2.3] talked briefly a bit more explicitly about which tools were used for which tasks and purposes. The facilitator mentioned that Oasen uses:

- *“Objects and artifacts for talking through metaphors”*. And that it’s can be used when *“getting to know each other, or talking about oneself through it.”* The purpose and advantages of using them seems to be that: It is a physical and material object that makes people feel safe and comfortable: *“...it has a material form and people start touching it. They actually often feel safe because they have something to hold, something to concentrate on. It’s a psychological phenomenon.”* Material objects also appeals to *“the sensuous. Which we think ideas can come from. We think that people get ideas in different ways. Some get them as pictures. Some as memories. Some because they feel it, and then get it somehow tactually through their body. Some may get it as a word; brick – brick wall – etc.”*
- Installations and modeling as a tool for idea generation. *“You put together lots of objects, writes keywords...”*
- Post-it notes when the groups have to conceptualize, put together alternatives, and choose. *“Post-its are sorted, switched around and you switch different colors, etc.”*
- During the concretization and the landing stages of the process, Oasen often *“works more with writing or logic.”* And then they usually *“end up writing on long white sheets of paper. Someway or another. Gathering. Simplifying. Formulating to-the-point. Then there’s a need to write. Particularly. Draw and get it down on paper.”*

The feedback shows a connection between some of the tools and certain stages of the process or specific tasks, but there’s not enough documentation to show that this is the norm or the standard in Oasen.

Based on the analysis above, it seems quite clear that there are different types of tools supporting different mechanisms. It’s still unclear which tools supports which mechanisms, but it seems quite easy to separate between to sets of tools: Tools whose main purpose is enabling and supporting collaboration and information sharing, and tools whose main purpose is forming the physical setting.

The tools referred to above, are tools used for idea generation, communication and collaboration during creative work. But Oasen also have a set of tools that not necessarily or directly enables communicating and sharing information, but works supportive concerning mechanisms like stimulating the senses. Many of these tools can be referred to as furniture or interior - tools forming the physical setting.

The documentation including the pictures and the feedback from the facilitators only gives us hints on how Oasen uses the tools and for which purposes. This is therefore a point that needs to be clarified through observations.

### 6.1.5 Categorizing elements in collaborative creativity

The results from analyses in the previous sections reveals a set of elements, semi-mechanisms, mechanisms and tools needed to enable and support co-present collaborative creativity. A categorization of the elements is shown below – as an initial understanding of collaborative creativity, which will be further studied during observations and analyses of creative processes.

A rough categorization divides collaborative creativity into four levels as visualized below:

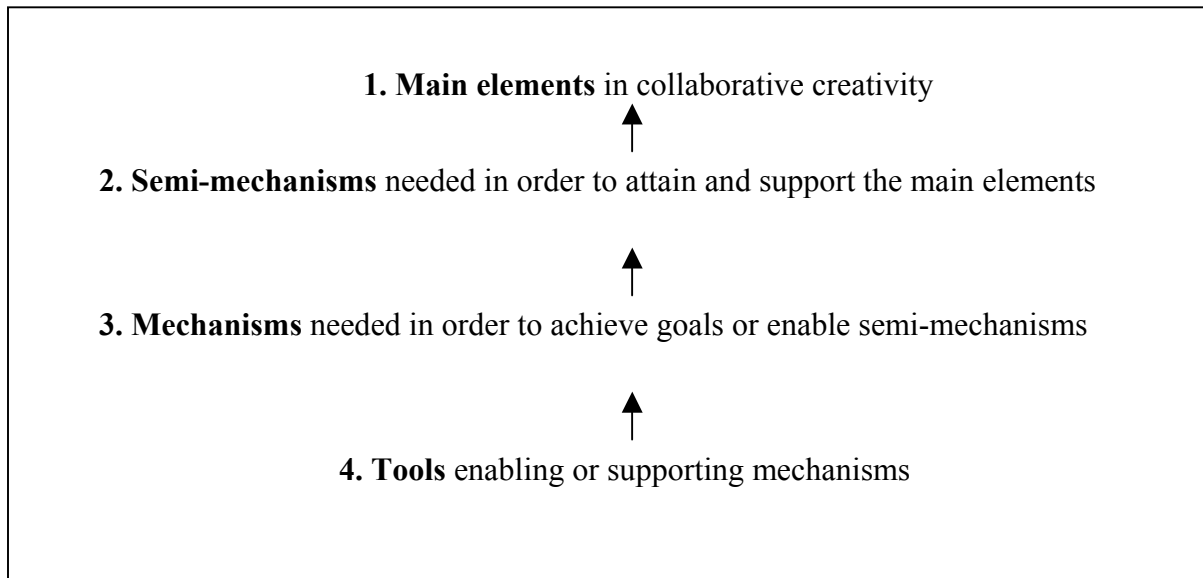


Figure 22 Initial categorization of elements in co-present collaborative creativity

The main elements in collaborative creativity: individual idea generation, collaboration and information sharing, and creative flow are the overall goals and tasks. In order to enable and support these, one must enable and support semi-mechanisms such as the human senses, associations and curiosity. These are again enabled and supported through the main mechanisms, such as using multi-communicative approaches and supporting physical movement. The ground elements in collaborative creativity are the tools, which enables and supports the mechanisms.

An example of how these elements are related could be that one uses colored chalk and blackboards as tools supporting a multi-communicative approach in order to stimulate the senses and people’s playfulness, which again might enhance and support one’s imagination and increase idea generation and enable creative flow.

The relation between the elements is almost like ingredients blended together in a dough. Butter, flour, sugar and milk are very easily recognized when appearing as a single ingredient, but once blended in a dough they appear as one element. The elements in collaborative creativity are difficult to identify when blended together. The model is an initial categorization based on the analysis of documentation of Oasen’s creative work. It will be used as part of a framework for analyzing creativity in practice. The elements will then be verified and clarified through observations, and the analyses of these observations will be the basis for the framework presented in chapter 7.



## 6.2 Structure of the creative work

In this section I will try to define the structure of the creative work in Oasen. Not only which elements are involved, as discussed in section 6.1.1, but more specifically how things are structured and deployed.

### 6.2.1 Overall structure

The facilitators at Oasen have a three-staged process they go through when conducting creative processes at Oasen: They start the planning with conducting “*preparation-meetings with the customers to clarify their background and needs as the basis for the design of the process.*” [B]. After the meeting, the facilitators then designs a process to fit the customer’s needs and goals, and the specified group of participants. Then the process itself is held at Oasen. Sometimes they might have a series of processes with the same customer. After each process is finished, the facilitator sums up and distribute results.

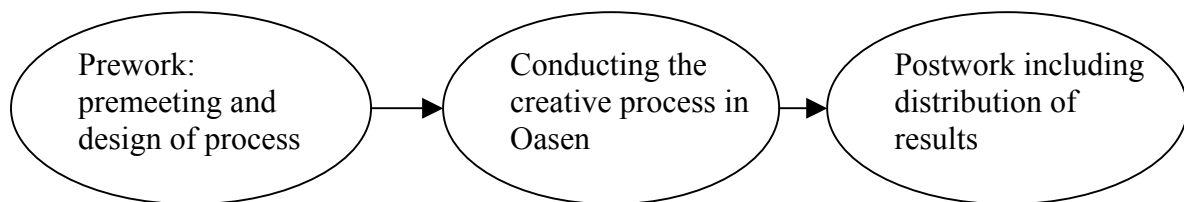


Figure 23 Initial model of overall structure

### 6.2.2 Elements in a creative process

Section 6.1 identified mechanisms and tools supporting collaborative creativity in Oasen, and the interplay between them. How these tools and mechanisms are connected, structured and implemented in practice varies from process to process depending on the customer’s needs and goals. That’s why Oasen creates specific process plans for each process using different tools and creative methods.

A creative process contains a set of elements connected to each other, including more than mechanisms and tools, as visualized in the model below:

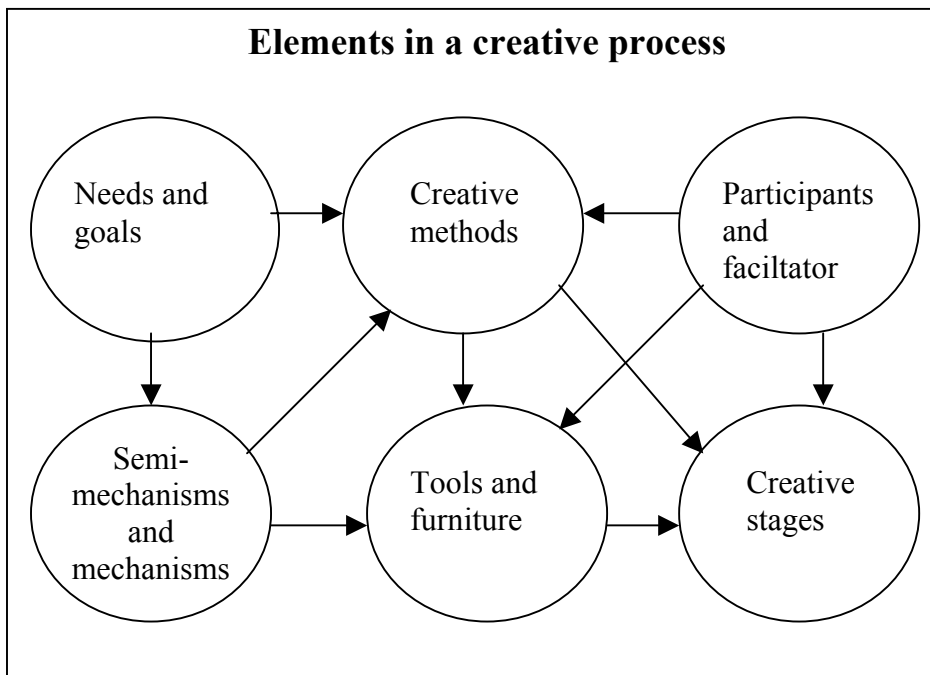


Figure 24 Initial model of elements in a creative process

The customer's needs and the goal(s) of the process is the basis for planning the creative process. The facilitator is the one who plans and conducts the process. That means finding out what the needs and goals are, which mechanisms and creative methods one can use to achieve the goals and needs. And which tools can support these mechanisms and methods. When the facilitator have figured out how to stimulate and trigger creativity to reach the goal, the creative process is split in creative stages fitted to each small task, method and tools that have to be used. Then the participants are invited to a process at the idea laboratory.

The elements in a creative process are very much intertwined and it will therefore vary which elements supports or determines which other elements that must be considered. For instance if the goal is to learn to think and work more creatively, the emphasis is probably put very much on creative methods and tools: Teaching and showing the participants how it can be done. If they goal on the other hand is idea generation for a new product, then maybe the emphasis will be more on stimulating certain mechanisms. It is not easy to give a single and objective model of the elements in creative processes and creative work, but I have made an attempt in order to categorize the elements to make a framework that can be used for analyzing creative work and as a conceptual framework when designing tools supporting creativity.

### **6.2.3 Creative stages in the creative process**

Creative processes held at Oasen are divided into a set of creative stages where each stage has a specific goal or task. The name and the content of the stages seem to vary a bit [Appendix 15.2], but Oasen claim that they have developed a main structure for creative processes which divides the process into the following stages [A, B]:

#### **1. Arrival**

Participants arrive at Oasen, and the facilitators try to establish an atmosphere that makes them feel comfortable, but at the same time also triggers their curiosity and interest. This stage is all about getting the participants in a creative spirit and motivating them to engage.

#### **2. Goal of the day**

This stage is about creating a common understanding of why they are gathered in Oasen: The theme or problem, participant's expectations, customer's needs, etc.

#### **3. Opening stage**

This stage is what Oasen uses as an opportunity to perform creative methods that stimulate the perceptual, visual and spatial dimensions. These methods are meant to trigger the exploratory interests and skills, and opens up for a comprehensive use of associative and metaphoric thinking. This stage supports original, energy-high, ingeniously, strange and surprisingly initiatives and inputs. Also referred to as the idea generation stage.

#### **4. Focus stage**

In this stage of the process, the focus is on concretizing: Participants view alternative elements and ideas from the previous stages. Then based on variations in time limitations, customer needs and goals, the participants either focus on further development and concretization of the ideas, testing or problem solving.

#### **5. Gather and secure results**

At the end of the process the focus is on taking care of and securing the results from the process. Documenting or storing necessary information for further work, and maybe plan how to follow up or implement the results.

#### **6. Landing**

The final stage of the process where everyone is given time to reflect upon the many ideas and impressions they've experienced during the process. The goal is to catch those ideas or comments that otherwise would be lost in the bustle of finishing the day.

The structure of creative processes will be further studied and clarified through observations and analysis of creative processes in section 6.3.

## 6.3 Observation and analysis of creative processes

### 6.3.1 1<sup>st</sup> meeting

My first introduction to Oasen was in January 2004. It was the initial meeting and the start of the cooperation between Oasen and the Department of Computer and Information Science (IDI) at NTNU. Participants were three facilitators from Oasen, professor Monica Divitini and two master students from IDI, including myself. One of the facilitators acted as a regular facilitator, while the other two acted solely as participants. The goal of the meeting was to establish cooperation between IDI and Oasen, and generate ideas around how to introduce ICT in Oasen.



Figure 25 The setting of the 1<sup>st</sup> meeting

My personal focus and interest in this process was to find out more about: What is Oasen? What do they mean by creativity? What do they use all their artifacts for? How is creative sessions run? And the most important thing of all: How can ICT be introduced in this setting?

#### 6.3.1.1 The structure of the process

The meeting took place in Oasen and was directed by one of the facilitators. The meeting was carried out as a creative process with different stages and part results. First there was a short introductory where everyone had to tell about themselves and their goals through an artifact. The goal was quite clear: We were all interested in exploring how ICT tools can be introduced in Oasen's work in order to support creativity. The meeting continued with an idea generation where each of us had to concretize and visualize different possibilities of using ICT tools in Oasen. The meeting, or the process, ended with a presentation of the ideas, a discussion of important elements to consider, and a discussion of where to go from here.



Figure 26 Tools used for visualizing and sharing

The process can be divided into the following stages:

1. Welcome
2. Set the agenda – clarify the purpose of being there
3. Individually introduce oneself and the reasons for being there
4. Individual idea generation on how to use technology to support creativity
5. Presenting the ideas to the group
6. Discussing the results, selecting the best ideas and making a short summary – a requirement list
7. Discussing further work
8. Digitalizing the ideas and the results by taking digital photos

Structure of 1<sup>st</sup> meeting-process:

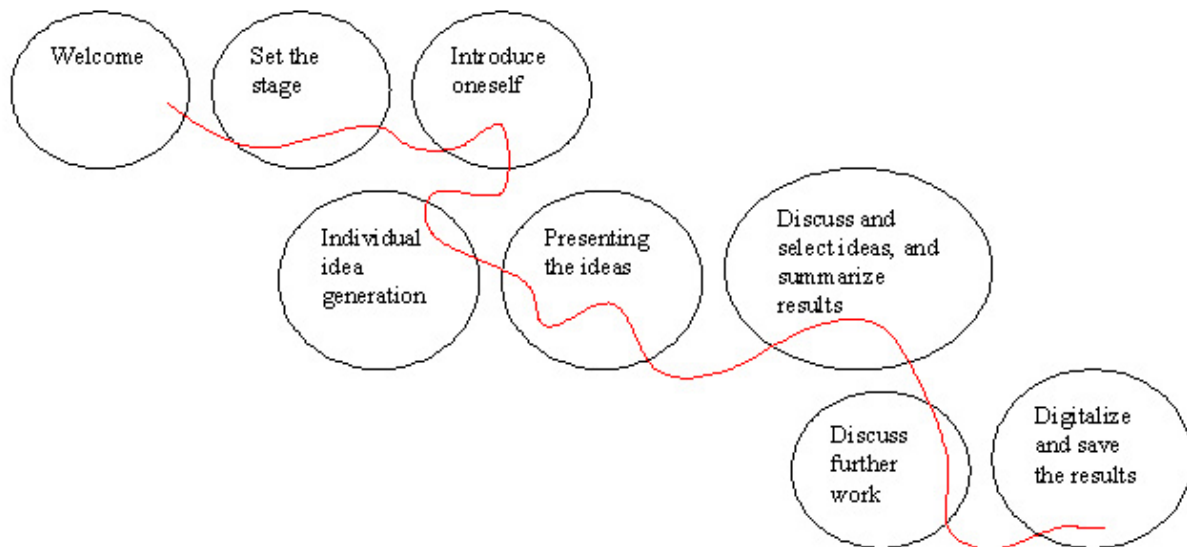


Figure 27 Structure of the 1<sup>st</sup> meeting process

### 6.3.1.2 Tools, tasks and mechanisms in the process

List of tools that were used and for which tasks and part of the process:

Tool	Task	Which part of the process
Toys and objects from shelves	To sit on	Introduced in 1
Toys and objects from shelves	Used as symbols when introducing oneself	3
Toys and objects from shelves	Concretize and visualize individual ideas	4, 5
A4 and A3 sized white paper	Concretize and visualize individual ideas	4, 5, 6,
Pen, pencils and crayons	To write and draw with	4, 5, 6,
Wooden boards	Support when writing on paper	4
Digital camera	Capture part of the context	4, 5
Digital camera	Digitalize results by taking photos of them	8

Table 3 List of tools used in the 1<sup>st</sup> meeting process

### Relations identified between tasks, tools and mechanisms:

#### A) Setting the stage

- Task: Arrive at Oasen, set the goals and introduce the tasks
- Tools: Odd artifacts laid out in the room showing where to be seated and where the action would take place.
- Mechanisms: The layout of the physical setting.
- Semi-mechanisms: Comfort, curiosity

#### B) Identification

- Task: Introduce oneself to the others
- Tools: Odd artifacts used as symbol in connection to verbal explanations
- Mechanisms: Multi-communicative approach
- Semi-mechanism: Supporting comfort, awareness and identification of participants.

#### C) Idea generation and conceptualization

- Task: Conceptualization through illustrations – concretize your ideas
- Tools: Paper, pen, pencils and crayons
- Mechanism: Multi-communicative approach with emphasis on visualization
- Semi-mechanisms: Trigger associations

#### D) Information sharing

- Task: Share ideas and results with others
- Tools: Verbal language, written text and drawings on paper, artifacts as metaphors or symbols
- Mechanisms: Multi-communicative approach including both visualization and tactile input.
- Semi-mechanisms: Playfulness, associations, curiosity.

#### E) Group discussion

- Task: Discuss ideas and come to a consensus on results
- Tools: Verbal language, paper and pen for taking notes and summarizing results
- Mechanisms: Democratic communication
- Important element in the task: The facilitator directing a creative method forcing a democratic communication.

Overall results show that this process very much focused on using a multi-communicative approach, supported by the use of paper and odd artifacts. One semi-mechanism not mentioned or identified in the initial analyses in section 6.1, was identification and awareness. These are important elements in all collaborative work, and therefore important elements in collaborative creativity. The processes in Oasen involve co-presence and face-to-face communication. That makes it very easy to support awareness, but in this process the awareness was enhanced by explicitly identifying the participants involved.

#### **6.3.1.3 Communication patterns and information sharing**

The communication in the process can be divided into three categories:

- The facilitator instructing the participants
- Individual participants presenting their ideas and views to the others in the group
- Dialogue between all participants, including the facilitator.

The facilitator directed the process and controlled the communication flow and the interaction in the group by using different creative methods, and by simply taking charge. He instructed the others in what to do and explained why.

The process included an individual idea generation and a presentation where each participant had to share their ideas with the rest of the group. The presentations were done verbally, but everyone used drawings and writings on paper to conceptualize and illustrate their ideas. Some also included artifacts from the shelves as symbols or part of their models.

The group discussions were mainly an open dialogue where everyone could speak out, but parts of it was directed by the facilitator so that everyone was given a chance to express their opinions. The communication was highly verbal, but keywords were written down by some of the participants and the facilitator. The facilitator also acted as a secretary writing down a summary of the ideas and the results.

#### **6.3.1.4 Considering ICT in creativity**

Oasen's way of working was new to me, but it wasn't as strange or far out as I had expected. One of the differences from traditional work settings were the fact that we sat on the floor instead of being seated around a table. The tools used weren't that different either, except for the toys and artifacts used to present ourselves. Most of the process, like the idea generation and its results were communicated and documented on paper. It doesn't seem that ICT will be as difficult to integrate as first imagined. One way to do it might be to simply replace existing analogue tools with ICT-tools. For instance replace the usage of paper with ICT-tools that supports writing, drawing, conceptualizing, and information sharing with emphasis on visualization.

The meeting resulted in ideas about which type of technologies might be suitable, and some implications for further work. The key issue discussed where certain requirements toward technology in creative work. The main conclusions were:

- Need for lightweight and mobile tools to support physical movement and flow.
- Need for integration in the physical setting.
- Need for user friendly tools.
- Stimulate sharing of information, both in the creative work at Oasen, but also to the external world.
- Wish for odd and unorthodox tools. Something that triggers people's curiosity.

### **6.3.2 SINTEF**

The customer in this process was a division from SINTEF research institute. 15 employees participated from two separate sections in the division. The process was facilitated by two facilitators from Oasen.

The purpose of the process was to:

- Come up with ideas for new projects
- Idea generation to uncover present and new markets
- Investigate how to nurture creativity in their organization
- Reflect on how to realize the ideas in order to make innovative products
- Based on the results from the points above, try to make strategy for creativity in the organization

#### **6.3.2.1 Description of the process**

The process started with a short welcome where the participants were served coffee and tea. The facilitators then introduced them to Oasen, clarified what was the goal with the process and explained shortly how they had planned the day, as presented in the process plan in Appendix 15.3.

One of the facilitators continued with an explanation of different creative methods which the participants could use in solving the tasks. Then the facilitators organized the participants in four groups with three to four participants in each group. They handed out instructions and helped each group to get started.

The groups were given different tasks and instructions in order to solve the overall problem definition and goals:

- Group one had to focus on how nurture creativity in the organization: How to support idea generation and how to realize the ideas.
- Group two were given the task of investigating existing customers and markets: Find out if there's any new markets to existing products, if there's any present markets needing new products, or any undetected customers.
- Group three were told to be visionary and investigate possible new markets and product trends: Which products do you think will be popular in five to ten years?
- Group four had to come up with ideas to new projects within their organization.

First task was to gather relevant information and inspirational sources. Then the groups were encouraged to continue with an idea generation where they had to come up with several ideas or possible solutions. The different groups approached and solved the tasks using different tools and artifacts assigned or available to them.

Half way during the day, the facilitator interrupted the work and called for lunch break. After the break they arranged an energizer game in order to get the participants back in the creative spirit. The energizer was a quite simple ball game where all the participants were standing in a ring throwing several small fabric balls at each other. Even if the game is simple it seems to encourage to collaborative creativity: It is fun - people starts laughing, and the participants are forced to move around physically. They have to use their coordination and awareness actively, which prepares the body for activity.

The next task was for each group to give a ten minutes presentation of their ideas and solutions, and how they had worked to come up with the results. The results differed quite a



bit both considering how the groups had approached the task, how they had collaborated, which tools they had used, and the results and ideas they had come up with:

Group one had spent quite some time discussing how to approach the task. They had quite different opinions and the facilitator had to step in and help them to choose an approach in order to proceed with the task. The group solved their task by visualizing their ideas through a model. The model was made using artifacts found in the shelves at Oasen. They made a flower and a bee as a metaphor representing their organization and a person's role within the organization. They used the model to conceptualize their ideas: They rearranged or used the model to show what each person meant during discussions. Their key idea and solution was to support creativity in the organization by allowing openness and the ability for people to walk around, socialize and share information with others.

Just like group one, group two also spent very long time on discussing how to approach or solve the task. They also experienced some problems in the group construction and communication since one of the group members very soon took the leading role. One of the facilitators intervened to avoid further problems like loss of interest or disagreements in the group.

Group two was given a blackboard to use - which became their main tool in the idea generation. The blackboard was fitted as a table enabling the group members to gather around it. It was frequently used both for writing and drawing. The group was instructed to use their professional expertise to generate ideas about new markets or new use of existing markets. The group solved the task by coming up with two ideas for new products that could expand their existing markets or be sold to new markets.

Group three was given a box with pictures and magazines, card boards and a regular working table. The group members immediately started to individually look through the material picking out interesting pieces. Then they very soon started to solve their task and prepare a presentation making a collage on the card boards. Their task was to be visionary about possible new markets, and their result was a strategy for how their organization could establish an office and sell their products in China. Their final result was very closely linked to their inspirational material: They had found several pictures of Chinese people on bicycles, and immediately started to think of China as a new market.

Group four was given the task of collecting inspiration outdoors. They were equipped with digital cameras, mobile phones with cameras and a notebook. They went outside of Oasen to take pictures. They were eager to start and forgot to take the notebook with them. When they returned, they had an idea generation where they all gathered around the notebook taking notes as they reviewed all the pictures they had taken. Because of tool limitations only one person could write the notes at the time. The group had been taking pictures of various buildings outside Oasen. The pictures were used to form ideas on how to improve the way concrete is currently being used as a building material. When presenting their ideas, they used a projector connected to a computer and visualized their ideas as a slide show with verbal comments.

After each group was done presenting, the other participants were encouraged to ask questions and short discussions arose. Then the participants were given two minutes to write comments on post-it notes and attached them to the respective group's presentation.

When all the groups were done presenting, the facilitators told the participants to find themselves a new group based on the ideas they found most interesting. The participants rearranged themselves in four groups consisting of two till six members. This clearly showed which ideas the participants found most valuable and interesting. The new groups were given approximately twenty minutes to continue working on the initial ideas. They had to concretize more and look at how to realize the ideas.

The process ended with a summary and a reflection on the day's tasks, experiences, results and how to carry on with the ideas after the process.

### 6.3.2.2 The structure of the process

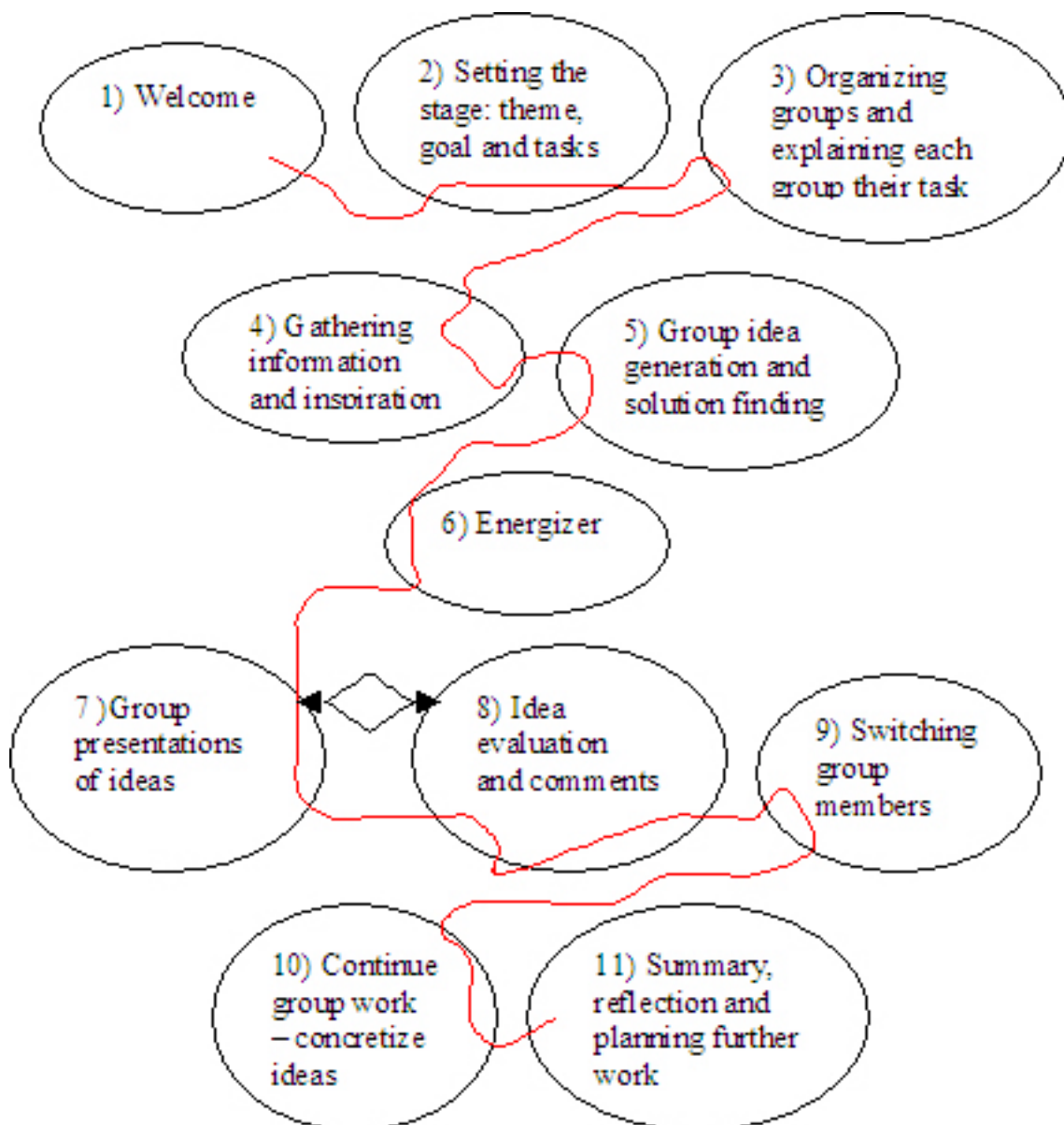


Figure 28 Structure of the SINTEF-process

### 6.3.2.3 List of tools that were used and for which tasks and part of the process

Tool	Task/used for	Which part of the process	Used by whom
Black board	Visualize introduction and instructions	2	Facilitators
Colored chalk	Writing and drawing on black board to conceptualize goals and instructions	2	Facilitators
Large wooden boards and feet	Used as work benches	mainly 3, 4, 5 and 10	Group 1, 3, 4
A4 sized paper	Separate tasks and instructions for each group	3	All participants
Colored paper	Taking notes during idea generation and making collages and models	4, 5, 7, 10	Group 1
Glue	Pasting things together	5, 10	Group 1
Scissors	Cut paper	5, 10	Group 1
Color pencils	Writing and drawing on paper	5, 10	Group 1
Colored clay/plasticine	Making a model: idea generation, producing result, presenting	4, 5, 7, 10	Group 1
Artifacts from the shelves	Inspiration, idea generation, making a model	4, 5, 10	Group 1
Black board	Used as work bench and drawing/writing surface	3, 4, 5, 7, 10	Group 2
Black board	Standing against the wall - used for summarizing and presenting	5, 7, 10	Group 2
Colored chalk	To write and draw on the black boards	4, 5, 10	Group 2
Bunch of pictures	Inspiration and idea generation	4, 5	Group 3
Magazines	Inspiration and idea generation	4, 5	Group 3
Card boards	To make collages - present result	5, 7, 10	Group 3
Glue	To make collages	5	Group 3
Colored post-it notes	To make collages	5	Group 3
Scissors	To cut pictures and magazines	5	Group 3
Pencils	Write and draw on card boards	5, 10	Group 3
Paper	To sketch on	5, 10	Group 3
1 laptop computer	Upload and review pictures, and used when presenting	5, 7, 10	Group 4
Notebook	Idea generation when reviewing the pictures	5, 10	Group 4
Projector	To enhance picture size - visualization when presenting	7	Group 4
2 digital cameras	Taking pictures for inspiration and idea generation	4	Group 4
Mobile phone with camera	Taking pictures for inspiration and idea generation	4	Group 4
Colored post-it notes	Write comments on, and attach them to other group's presentations	7, 8	All participants
5-6 fabric balls/hackisacks	For energizer/ball game	6	Everyone

Table 4 List of tools used in the SINTEF-process

Some tools were appointed specifically to each group, but not all of them were used. For instance didn't group four use the large white poster and the color pencils that were laid out on their work bench.

Other tools and artifacts were available in the room, but group one was the only group that started to use tools that were not directly appointed to them. They very soon showed an interest for the tools and the artifacts in the shelf close to them. The reason might be that these tools were very visible to them, and that they immediately caught their interest because of their playful and odd nature.

#### **6.3.2.4 Elements and relations identified in the process**

The following elements and relations were identified in the process:

- The physical setting with its many usual tools and artifacts seems to trigger curiosity, physical movement and involvement.
- Inspirational resources like pictures, magazines, toys and other artifacts seems to support idea generation by enhancing people's imaginations and associations.
- The facilitators' work to keep the groups on track; helping them to choose tools and methods, making sure they have progression, asking them the right questions and such.
- Correlation to professional background: Participants seems eager when having the opportunity to use their professional backgrounds in the creative work. They seem more familiar and at home. This also seems to give a tight relationship and ownership to the results.
- Many of the tools seems to support collaboration and creativity by enabling:
  - Visualization
  - Information sharing
  - Editing and the ability to actively work to make something; like a model or a collage.

#### **6.3.2.5 Information sharing and communication patterns**

The communication and the information sharing in the process can be divided into three main categories:

- Communication and information sharing **from the facilitator**
  - to all participants in plenary
  - to separate groups
  - to individuals in a group
- Communication and information sharing **within the group**
- Communication and information sharing **between the groups**

The facilitators mainly communicated verbally to the plenary, or by approaching and helping each group or individual. In order to concretize and visualize their information they used a few tools like the black board and A4 papers. The facilitators were very active and communicated a lot in plenary during the introduction and during the summary at the end of the day. They didn't say much during the group work, but stayed visible and helped when necessary, or interrupted when they felt it was time for progression.

It was very much up to each group to decide how they wanted to communicate and collaborate. The facilitators did not plan or run any specific methods in order to control the communication or the information sharing in the groups. Two of the groups seemed to have a very democratic communication pattern where everyone participated. The other groups

seemed to have a communication pattern where one or two persons in the group were doing most of the talking.

Communication between the groups seemed to be almost non-existing during the creative group work. Most of the participants seemed quite focused on the task, and didn't bother to look at what the other was doing. A few seemed a bit uninterested and unfocused both in their own group's task, but also in what the other groups were doing.

The process was designed to support information sharing and communication between the groups at two points: Stage 6 during the energizer game and stage 7 when the groups presented their ideas.

#### **6.3.2.6 Discussing ICT in creativity**

Group four actually used ICT tools in this process, with success. They didn't seem to have any difficulties, and the results were good. In other words; this process is a good example showing that using ICT in creative work can work! And that it seems to work very well for idea generation and visualization.

This process shows that people seem to be very creative during the idea generation, in concretizing results and in making a presentation. The presentations however didn't stand out as very creative. They were very much like any regular presentations where one or a few persons verbally presented the results for a plenary group. One way of using ICT in the creative work could be to enhance the creativity and the quality of the presentations. ICT tools enable the usage of new features like sound, video, greater visualizations, etc. The process also indicates that using ICT for supporting the presentations as they are today could be done quite simply by replacing some of the tools with ICT. One could replace existing tools with ICT-tools that enables generation of information, editing possibilities, information sharing and visualization in the same ways the analogue tools already do.

One of the facilitators mentions in the introduction that it's no point in being creative right here and now if the ideas are not adapted and further processed afterwards. One of the goals in this process was to teach the participants how to nurture creativity and which steps to take to realize their ideas. That is actually quite ironically what Oasen seem to struggle with themselves. The process results in very creative and valuable ideas or products. Unfortunately it seems that the ideas never make it into the real world. There's no documentation of the work done during the process. There's very little distribution of results, mainly because the results are very difficult to distribute in their original form or shape. It's very difficult to distribute a clay model. You can take pictures of it, and distribute the pictures, which is mainly how Oasen do it today. But it's difficult to edit and keep on working on a picture. It's also very difficult to see or remember the connection between the model, the metaphor, the ideas, the context and the other results. This might be one aspect where ICT could help support creativity: Capture, document, store and distribute the results and ideas made during a creative process. ICT could help enlarge the creative space from one process in Oasen, and into the regular workspace where the participants usually are.

The results from the process show that it's not difficult to run processes where the groups and the participants are assigned to or choose different tools and artifacts to solve the tasks. When introducing ICT this means that all participants not necessarily have to be forced into using

tools that they don't feel comfortable with. It is possible to use ICT tools in part of the process or by some of the groups only.

Concluding summary:

- The process shows that ICT easily can replace existing tools which supports idea generation, information sharing and visualization.
- ICT have potential when it comes to
  - Documenting the process by storing the results
  - Making it easier to distribute the results
- ICT tools might enhance or support creativity in new ways by adding new features and editing possibilities.
- ICT can be deployed and integrated as an optional tool. It can be deployed only in parts of the creative work, or only by some of the participants.

#### **6.3.2.7 Other comments**

Other processes observed have used methods or tools that force the participants to share or have a very democratic communication during the idea generation. This process seemed more open in the way the participants communicated and collaborated.

This is the only process observed where the groups have been assigned specific and very different set of tools and instructions. All other processes observed have given the groups the same tasks and the opportunity to use the same tools and artifacts. The idea of doing so might have been to show the participants how they can make use of different tools, and what the results might be.

### 6.3.3 EiT

This process was a part of the evaluation and further development of an interdisciplinary project concerning all students at NTNU. The project is called EiT, an abbreviation for Experts in Teams<sup>1</sup>. The goal of the process was quite clear; Gather those interested and provide an arena to discuss how to evaluate and grade group results in the project. The head teaching staff was invited, and 16 professors turned up.

#### 6.3.3.1 Description of the process

The participants arrived separately, and the process started with a welcoming session with coffee and waffles. Many of the participants knew each other beforehand, but this welcoming-stage also gave them the opportunity to greet and introduce themselves to others.

When all participants had arrived, the project manager of EIT formally welcomed and introduced them to the theme and the goal of this process. Then he introduced them to the facilitator who explained more in detail the reasons for being there, and which tasks they were to perform during the process in order to reach the goals. Not everyone agreed on how to proceed. Some expressed dissatisfaction with the information they had gotten beforehand and clearly had other expectations. A discussion arose, but the facilitator broke through and followed his pre-planned agenda.

The facilitator divided the participants into four groups with four persons in each group. They were instructed to place themselves away from the other groups. Information about the 'problem', the tasks and instructions were handed out on papers to each person. The facilitator also gave an oral explanation of the tasks, and a short summary on the blackboard.

The task was to individually evaluate four extracts from different EIT project reports. They had to grade each example, and then list the criteria they used when grading. Then based on their way of evaluating and their criteria, the participants were encouraged by the facilitator to start discussing different criteria within their group. Some had made notes which they showed to others, but most of them explained their ideas and criteria verbally. The facilitator also asked them to summarize a group result of which criteria they find important when evaluating project results, and possible disagreements connected to these criteria within the group. In two of the groups each member noted the results individually on their own pieces of paper. In other groups one person functioned as a secretary writing down keywords and short sentences while the group members were discussing. The groups progressed pretty much as planned, except for one that were struggling both with motivation, cooperation and with reaching a consensus. The participants in the group started working as two pairs instead. With some extra attention and help from the facilitator, they managed to produce two sets of results as an alternative to reaching a consensus.

When most of the groups seemed to have agreed upon a result, the facilitator broke in and started a plenary session where each group presented their result to the others. The facilitator asked each group to fill in their results on a couple of A3 sized posters hung on the wall while presenting. Nobody seemed eager to do so, so he ended up doing it for them. The groups merely managed to finish their presentations before the specified time was up. Some had to leave right a way, while others stayed a bit longer discussing the results.

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<sup>1</sup> [www.eit.ntnu.no](http://www.eit.ntnu.no)

Despite complains about difficulties in evaluating and grading the project reports, the results of the process showed that almost every group and participants had evaluated and graded quite similarly. The list of results was handed over to the project manager, and most participants took their notes with them for further work in order to establish guidelines for evaluating and grading the project results.

A short summary of the structure of the process is visualized in the model below:

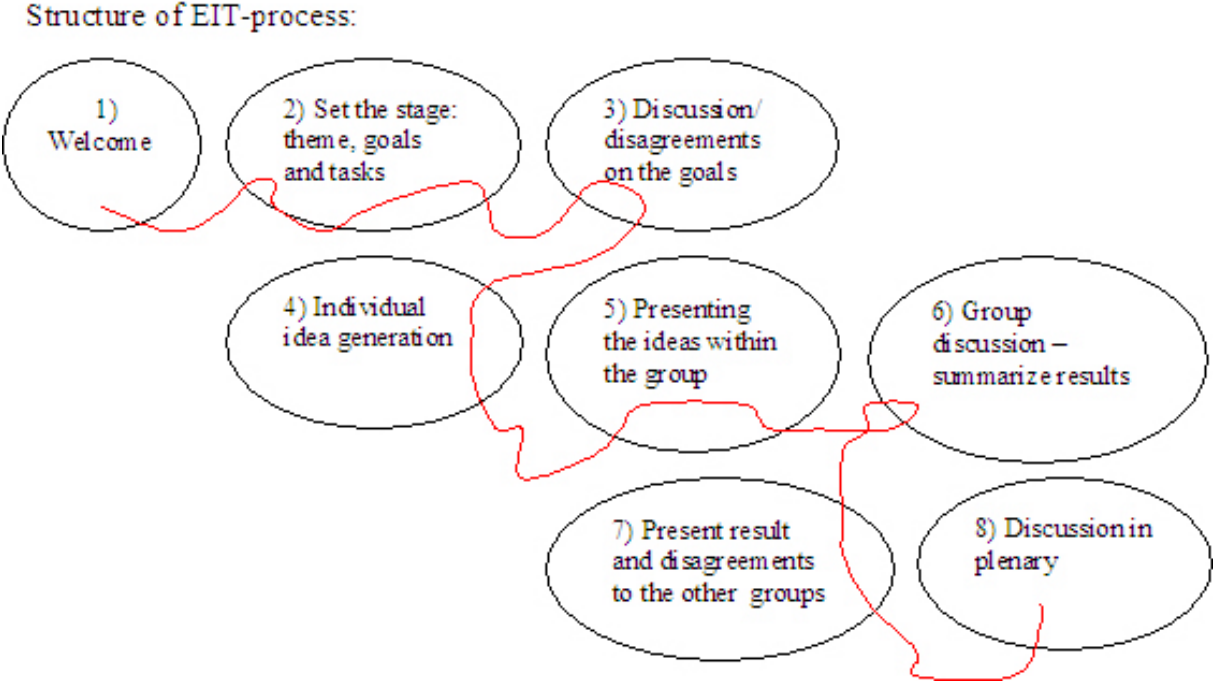


Figure 29 Structure of the EIT-process

**6.3.3.2 List of tools that were used and for which tasks and part of the process**

There was very low usage of tools and artifacts in this process. Most of the process was based on oral discussions. The only tool used was paper. This was used for individual brainstorming and idea generation, and for note taking during oral information sharing.

Tool	Task	Which part of the process
Chairs	To sit on	1-8
Information given on A4 sized paper	Understanding the problem, setting the stage and defining the goal and the tasks for the process	4
A4 sized white paper	Concretize and visualize individual ideas	4
A4 sized white paper	Write down other peoples viewpoints	5, 6, 7, 8
A3 sized white posters	Write down group results	7
Pen, pencils and crayons	To write and draw with	4-8
Blackboard	Summarize points	4
Digital camera	Capture part of the context	4-6

Table 5 List of tools used in the EIT-process



### 6.3.3.3 Elements supporting collaborative creativity

The process showed that the following elements are important in order to support co-present collaborative creativity:

- The facilitator's **pre-work** is important: He needs to have a very clear understanding of the topic, **the goals**, who the participants are and their **expectations**.
- Negative attitudes towards creative work or the way it is carried out is a great hindrance to the work and for making good results. **Creating a positive atmosphere** and interest in the task is therefore important.
- **The facilitator** was a crucial mechanism or factor in order carry out this process and producing a result. If he had not been there to clarify the goal and to proceed with the process as planned, there might not have been any discussion or any results at all.

Because of the way things proceeded in this process and the low usage of tools and creative methods, it is easier to describe which mechanisms were **not supported**, than which were:

- **Visualization** was low: There was little use of tools supporting visual communication and sharing. Only tools used was A4 sized paper for individual writing, which then made it difficult to share the results with others. Only two communication channels were used: verbal and written on paper. In other words; the process was not supporting a **multi-communicative approach**.
- **The physical setting** was very traditional: All participants were seated on regular chairs which did not 'invite' them to move around or approach the other participants. The result of that was close to no **physical movement**.

### 6.3.3.4 Considering ICT in creativity

My observational focus was the facilitator – his role and tasks in the process. The idea was that from this point of view it would be easier to get a clearer idea of how to introduce and deploy the technology in the creative work. And get a clearer idea of the structure.

Introducing and deploying ICT technologies in the creative work in Oasen would mean a strong involvement of the facilitators: It is them who plan and runs the creative work; from prework to postwork. It is them who decide which mechanisms to focus on and which creative methods and tools to use for supporting these mechanisms. It is therefore important to make them aware of the possibilities; the affordances and constraints of different tools.

The process provided a better understanding of the overall structure of the creative work. Not only the different stages of the creative process itself, but also a better understanding of what kind of pre- and post-work is done by the facilitator and the participants. And how important this work is. One can easily divide the creative work into three steps: Prework, the creative process and postwork. But there is a strong connection between the steps, which must be kept in mind when introducing and using ICT for support. For instance; it is difficult to distribute digital results as part of the prework if there is no digital capture and storing occurring during the creative process.

### 6.3.4 ISFIT process

ISFIT<sup>2</sup> is the International Student Festival In Trondheim. It is a festival and a conference gathering students from all over the world. Their goal is to promote international student cultures, encourage exchange of experiences and invite people to debate important student topics in the world today.

The festival is held every second year, and this process was part of the preparations for ISFIT 2005. The process was part of a workshop weekend for ISFIT group leaders during the fall 2004. The festival is primarily run by student volunteers where some of them are given the task of leading debates and workshops. The goal of this workshop weekend was for them to get to know each other, learn how to lead a debate and how to act as group leaders.

The goal of this process was therefore to prepare the students for the role as group leaders:

- Give the students a better understanding of what it means to be a group leader
- Make them aware of their personal qualities
- Reflect upon how to act as a group leader; how the group leader affects the group
- Give them insight in how to run creative processes and workshops by teaching them a few creative methods.

The process was run by two facilitators and 30 students participated.

#### 6.3.4.1 Description of the process

All participants arrived at the same time. The facilitators introduced themselves, welcomed the participants to Oasen and explained the goals with the process and roughly the tasks they were to perform during the process. The participants were divided into five groups, each with six participants. The groups were given colored post-its with one color for each group: Green group, orange group, blue group, pink group and yellow group. All participants were asked to write their name on a post-it and use it as a name tag. Five piles of different colored artifacts were spread out in the room. Each group then had to find their place according to the group color.

First task was to individually write down personal qualities on a piece of paper while sitting in groups. The instructions from the facilitators were to draw an ellipse, divide it into two and write about personal qualities they want to bring into ISFIT on one side, and other good qualities on the other side.

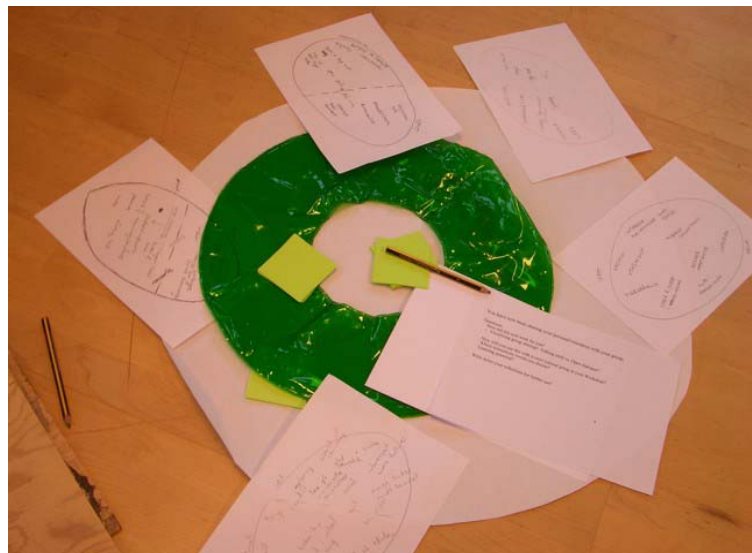


Figure 30 Results of green group's idea generation

Then the participants were introduced to a method called talking-stick: The person holding a stick or pen talks, while the rest of the group keeps quiet and listens. Each person in the group

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<sup>2</sup> [www.isfit.org](http://www.isfit.org)

gets two minutes to tell about themselves and their qualities. When the two minutes are up, the stick must be passed on to the next person. The method used in order to have a democratic communication. Everyone in the group was given the possibility to tell about themselves. It actually forced them to do so. When everyone in the group had presented themselves, the facilitators encouraged them to continue with an open dialogue where everyone in the group could speak freely.

A few minutes later, the facilitators handed out a set of questions on a piece of paper and told the participants to discuss the questions in the group and come to a set of conclusions. The task was to reflect upon the method used [talking stick and open dialogue] and how these methods can be used in a debate or workshop at the ISFIT festival.

The task was interpreted and conducted very differently by the groups: Some groups started discussing right away and then summarized a set of conclusions at the end. Other groups started writing down individually thoughts on paper and then shared and discussed their ideas afterwards. One group even had a discussion on how to interpret and attack the task itself. The result of choosing different approaches was a varying noise- and energy-level in the room, but no one seemed bothered or disturbed by the others.

After a short coffee-break, the facilitators gathered all the participants in a circle and introduced them to what they call ice-breaking exercises or energizers: Which is tasks and methods that for instance can be used for:

- Getting people in a creative mood by doing physical and playful exercises.
- Getting people to know each other better: Get people to open up, share ideas, communicate and trust others.

In this energizer, the participants were divided into pairs and asked to cooperate by walking around in the room holding a small stick between them, using only one finger each. They were told that one person should lead the way, and the other should follow. And then they were told to switch after a couple of minutes. The facilitator stopped the play after a short while and asked the participants a few questions like; How easy did your partner follow your instructions? The goal was to reflect upon leadership.

The next task was as an example of how to stimulate people's imagination, which also included a reflection of how important it is to have goals. The facilitators handed out descriptions of an imaginary situation. Each group was given a different case. The task was to identify why it was important for their case to have a goal.

The participants were instructed to start with an individual idea generation where they had to write down each idea on a post-it note. When everyone in the group had finished, they had to share their ideas with the group by putting their post-it notes on to a large poster. Then the groups were told to categorize their ideas and hang the poster on the wall for everyone to see. The task ended with a "share and take": The participants were encouraged to wander around in the room, look at other groups' results, and write down and "steel" valuable ideas from the other groups. The facilitators ended the task when the participants seemed finished or started to lose interest in the task.



Figure 31 Blue group categorizing the ideas



Figure 32 Green group's idea generation and categorization

The participants were given a break where they could chat over a cup of coffee or explore the artifacts in the room. They were given a quarter to relax and fool around before the facilitators interrupted and introduced a new energizer to get them started again. One of the facilitators explained the task as very simple: *"Just follow my instructions."* Then he started to do different physical movements like hopping on one foot, keep one arm hanging on the side, rolling around on the floor, and so on. The participants copied his movements without him having to orally explain or ask them to do so. This play went on for approximately ten minutes until one of the participants finally refused to follow one of his moves and questioned the goal and the meaning of the play. The facilitators then explained the purpose of the game: Their goal was to show how easily people will follow a leader. There was a short discussion about this connected to the participants' roles as group leaders during ISFIT. The other goal was simply to get the participants back in the creative flow they were in before the break.

The next task was a continuance on the idea generation done before the break. The

participants were told to go back to their group and concretize the goals they had come up with or stolen from other groups. They were introduced to a new method often used when concretizing – De Bono's hats. The goal of this method is to teach the participants how to view the ideas or arguments from different perspectives. Each participant in the group was given a colored hat to wear and a paper with instructions on a specific role to play in the concretizing task: The person with the white hat had to evaluate the ideas in a very objective way based on the facts. The person with the red hat had to base the evaluation on feelings, emotions, intuition and gut feeling. Black hat meant being analytic, critical and "the devil's advocate". Yellow hat had to be naive, optimistic and very positive to everything. Green hat had to view the ideas from a creative, inventory and problem solving perspective. Blue hat were the



Figure 33 Pink group summarizing final result

person that had to have the overview, who structured and organized the material, and who made decisions. Based on these roles each participant was given two minutes to criticize or evaluate the ideas from the previous task. When everyone had finished, the group were told discuss and list the five best ideas on a piece of paper, and to hang the paper on the wall when finished.



Figure 34 Visualizing the groups' final results

The plan was that all the groups would present their results in plenary. Due to the limited time frame, only one group was selected to do so. The group member's took turns explaining each point on the list. The presentation was orally and the only tools used were the list on the wall and an object held by the person speaking. Almost like a talking stick.

The process ended with an individual reflection. The participants were told to reflect upon what they had learned during the process and how they could use knowledge as group leaders during ISFIT. The participants were also given the opportunity to ask questions to the facilitators.

### 6.3.4.2 ISFIT process structure

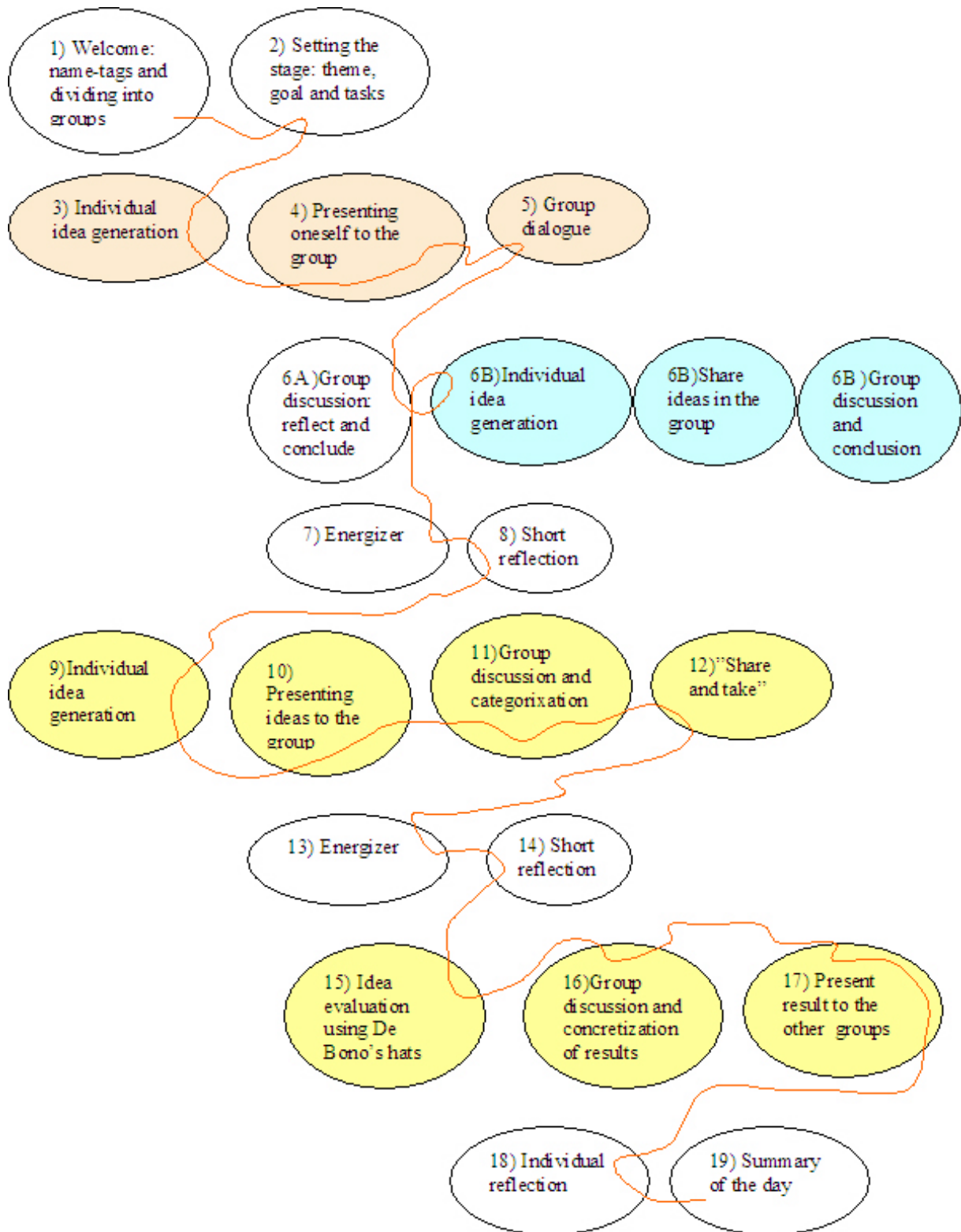


Figure 35 Structure of the ISFIT-process

The structure of the process is very complex compared to the other processes observed, but there's a clear repeating pattern in this process which seems to be the general structure of all processes:

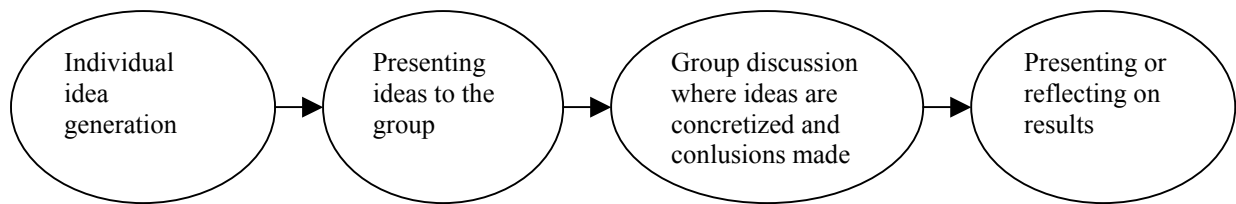


Figure 36 General structure in the ISFIT-process

If a creative process is defined by the stages listed above, then this process is actually a creative session containing several small processes. And according to the process plan [Appendix 15.4] each stage also has different goals. The goal of the pink stages is for the participants to get to know each other and reflect on which personal qualities they have that can be used in the role as ISFIT group leaders. The goal of the turquoise stages is to reflect upon the creative methods used in the prior tasks and discuss how these can be used effectively in their work as group leaders. The goal of the yellow stages is mainly to introduce the participants to creative work in practice: How to stimulate people's imagination, how to stimulate sharing of ideas, and how to concretize and make results.

By combining several small processes with different goals and approaches to creative work, the participants get to experience the creative work from different perspectives.

### 6.3.4.3 List of tools that were used and for which tasks and part of the process

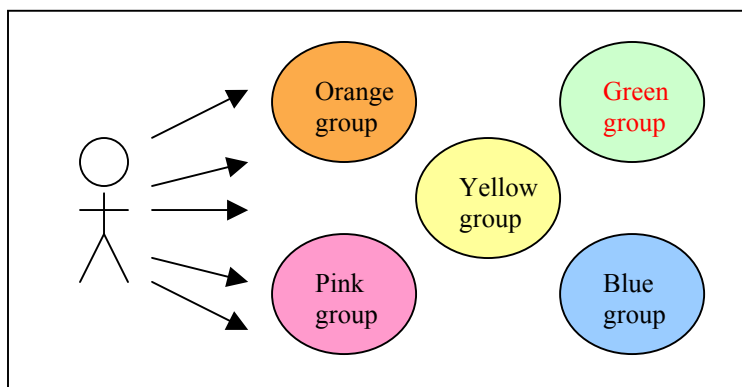
<b>Tool</b>	<b>Task</b>	<b>Which part of the process</b>
Different colored post-its	Name-tags	1-19
Different colored post-its	To write ideas on	9-12, 15
Different colored artifacts	Visualize the groups' physical place in the room, and to sit on	1-19
Pen and pencils	To write with	1, 3, 6, 9, 12, 16, 18
Pen	The object used in talking-stick	4
A4 white paper	To write and draw on	3, 16, 18
A4 white paper	Visualize result	4, 17
A4 white paper	Instructions from facilitators	6, 9, 15
Tape	To hang posters on the wall	12, 17
De Bono's colored hats	Artifacts to identify people's roles	15
Round white poster	To present group results	10-12, 15
Black board	To visualize instructions	2, 3
Small wooden sticks	Artifact used in energizer	7
Wooden boards	Support when writing on paper	3, 16, 18

Table 6 List of tools used in the ISFIT-process

### 6.3.4.4 Communication patterns and information sharing

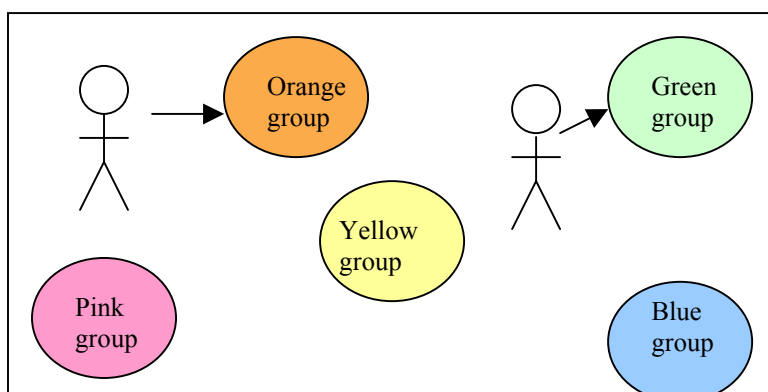
Table 7 Communication from facilitators to the participants

From who	To whom	Tool or form of communication	What was communicated or shared?	Process stage #
Facilitators	Participants	Verbal explanations	Welcome, about Oasen	1
Facilitators	Participants	Verbal explanations	Theme, goals and today's work	2
Facilitators	Participants	Verbal explanations	Instructions on tasks	before 3, 6, 7, 9, 12, 13, 15, 18
Facilitators	Participants	Written text and drawing on black board	Instructions before the first task	before 3
Facilitators	Participants - some times in plenary and some times individually to each group	Verbal	Telling the groups to proceed with next part of the task	before 4, 5 8, 10, 11, 14, 16, 17
Facilitators	Participants	Verbal	Announcing break and break is over	between 6-7 and 12-13
Facilitators	Participants	Verbal	Asking and answering questions	2, 8, 14, 17, 19



Facilitators took turns in communicating to all participants in plenary.

Figure 37 Facilitator communicating to the plenary



Both facilitators moved around in the room and helped each group or individuals in the groups: Answered questions about the tasks and made sure that there was progression in the work.

Figure 38 Facilitator communicating with groups or individuals



Table 8 Communication and information sharing within the group

From who	To whom	Tool or form of communication	What was communicated or shared?	Process stage #
Participant	Participant's group	Verbal	Personal qualities	4
Participant	Participant's group	Verbal	Ideas	6, 10
Participant	Participant's group	Post-it notes on poster	Ideas	10
Participant	Participant's group	Verbal while wearing colored paper hat	Their role's point of view on the ideas	15
Participant	Participant's group	A4 sized paper with writings and drawings on it	Personal qualities	4
Participants in the group	Participants in the group	Verbal dialogue	About each other's interests and qualities, and about being part of ISFIT	5
Participants in the group	Participants in the group	Verbal dialogue	Discussing the ideas: which are the best and what should be the conclusion	6, 11, 16
Participants in the group	Participants in the group	Re-arranging post-its on a poster	Telling which ideas they think is best, and in which categories they belong	11

There were mainly to types of communication patterns in what could be called core group work:

Discussions and dialogues where everyone have the opportunity to communicate and share information with the other group members:

Individuals sharing their ideas with the rest of the group:

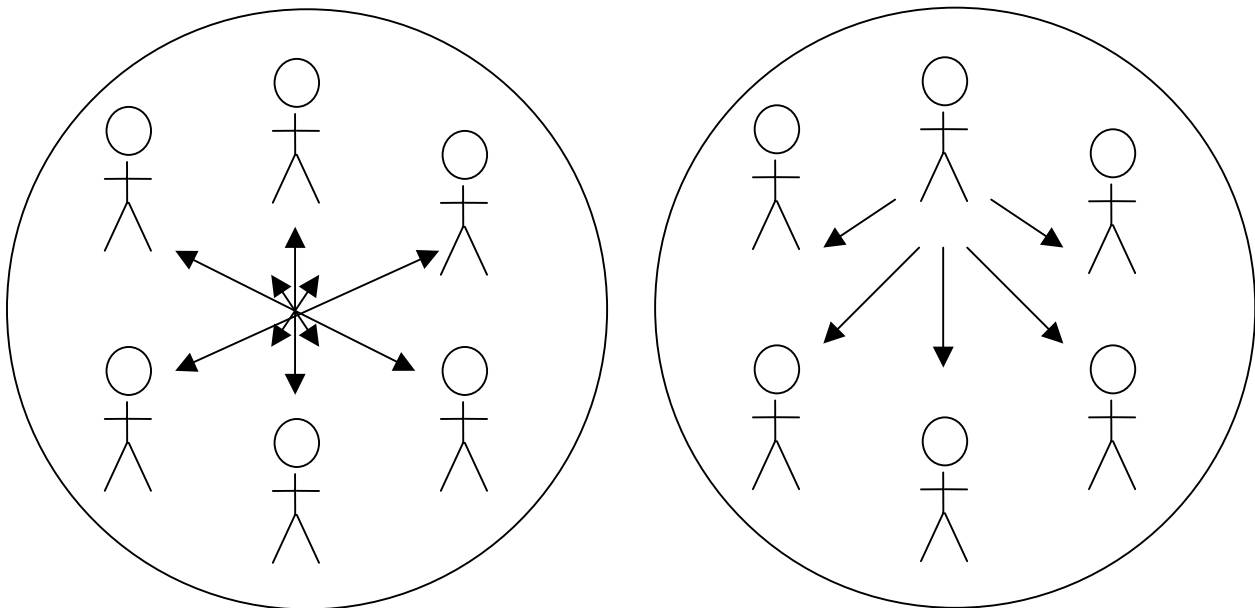


Figure 39 Group dialogue and individuals communicating to the group

Table 9 Communication and information sharing between the groups

From who	To whom	Tool or form of communication	What was communicated or shared?	Process stage #
Each group	The other groups	Poster with post-its	The group's ideas	12
Each group	The other groups	A4 sized paper with listed points	The group's final result	17
Each group *	The other groups	Verbal	The group's final result	17

\* the intention was for each group to hold a presentation, but time limitations only allowed one group to do so

There was little verbal communication between the groups during the process. Most of the information sharing was done through writings and drawings on paper, which then was visualized and studied by the other groups:



Figure 40 Visualization using posters and colored post-it notes

Table 10 Communication between the facilitators

From who	To whom	Tool or form of communication	What was communicated or shared?	Process stage #
Facilitator	Facilitator	Verbal	How to adjust the plan as the process proceeded	
Facilitator	Facilitator	Eye-contact and body language	To check which groups the other facilitator is helping	1-19

Table 11 Other types of communication and information sharing

From who	To whom	Tool or form of communication	What was communicated or shared?	Process stage #
Everyone	Everyone	Verbal	Chatting about everyday things	1, during breaks, and in between when time
Participants	Facilitator	Verbal and body language	Asking for help - for instance; to interpret the task	3-18
Participants	Facilitator	Verbal	Asking and answering questions	8, 14, 19
Participants	Everyone	Post-it note with name written on it	Their name/identification	1-19

#### 6.3.4.5 Mechanisms supporting collaborative creativity

The following mechanisms seem quite important in order to support collaborate creativity in this process:

- The **physical setting** triggering curiosity and playfulness
- **Creative methods** that supports:
  - **Democratic communication** and forces participants to engage in the tasks.
  - **Information sharing** both in within each group, but also between the groups.
- **Visibility** through different tools helping conceptualization and information sharing.
- **Identification** and feeling of belonging.

The physical setting with its many unusual artifacts, toys and tools seems to trigger the curiosity and the playfulness of the participants. They immediately start looking around, trying out the toys and searching for interesting things in the shelves.

The facilitators used and introduced the participants to a few creative methods – that is ways of planning the tasks to bring out the imagination, curiosity and interest in the participants while managing to get a results as well. In this process the participants were introduced to:

- Talking stick
- Open dialogue
- Visualizing ideas and group sharing
- Share and take
- De Bono's hats
- Ice breakers and energizers
- Reflections

These methods contained different mechanisms supporting creativity. For instance is the method 'Talking stick' an excellent way of achieving a democratic communication in the group. Everyone get to share their ideas without being interrupted or ignored by others in the group. The participants are actually forced to come up with and share their ideas. 'Share and take' is an excellent method for supporting information sharing between the groups: Each groups results are displayed and the other groups can then steel their ideas and make them their own. This might enhance creativity in the way that more and other types of ideas might trigger the participants to think in different directions.

Using post-it notes to visualize ideas is a very simple way of visualizing the group sharing and each participant's contributions. Visualizing individual thoughts through either post-it notes or drawings on A4 sized papers also helps each participant to conceptualize and communicate their ideas to the others. It's easier to understand what they mean when they communicate both verbally and visually.

One mechanism that has not been mentioned by Oasen as important, but which is observed in this process is the identification of participants and groups by using name tags and colors. This might enhance the group feeling and make it easier for participants to start communicating.

#### **6.3.4.6 Considering ICT in creativity**

The process reveals four main stages in the creative process:

1. Individual idea generation
2. Presenting ideas to the group
3. Group discussion where ideas are concretized and conclusions made
4. Presenting or reflecting on the results

This structure can be used as a categorization and a division when introducing ICT tools: Dividing the creative work into four stages with different goals, usage areas and users. For instance; In individual idea generation one must support the interaction between the user and the tool, such as usability, and one must support creative methods enhancing individual idea generation. It seems to be a good idea to use different tools to support different stages, but also the relation between them.

The process also reveals four communication patterns:

1. Facilitator to participants
2. Individual to group
3. Communication within the group
4. Communication between the groups

These patterns shows how people communicate and collaborate, and can be used as part of a guideline for introducing CSCW tools supporting collaborative creativity.

This process used a range of different tools, but the most important one, especially for communicating and sharing information, was the use of paper: A4 sized white paper for individual writing and drawing, large white posters for group results, and colored post-it notes representing ideas or comments. Introducing ICT could quite simply be done by replacing the usage of paper, or some of it, with digital tools like electronic whiteboards.

Examples of how digital tools could replace the use of paper could be:

- Hand out instructions on PDAs instead of A4 sized paper
- Replace A4 sized paper with PDAs or digital pens for individual idea generation, and use digital transfer for sharing of ideas with the group
- Visualize instructions on electronic whiteboards instead of using the blackboard
- Use electronic whiteboards to visualize group results, instead of white posters
- Replace colored post-it notes with digital tags on e.g. electronic whiteboards using a drag-and-drop function of the tags

## 7 Framework for co-present collaborative creativity

The framework described in this chapter is a descriptive framework defined in order to give a conceptual understanding of Co-present Collaborative Creativity, named the 3C framework:

The 3C framework defines the structures and the elements constituting co-present collaborative creativity. The object is to define a conceptual framework that can make it easier to design new technologies and give insight in how to possibly introduce and deploy them.

The framework is based on results from observations and analyses of my case Oasen, but the objective is to generalize in order to define a framework for all kinds of co-present collaborative creativity. General conclusions are made based on the analyses and categorization of elements described in section 6.1, the analysis of structure in creative work described in section 6.2, and the observations and analyses of creative processes described in section 6.3.

The framework starts with a description of the overall structure in creative work with focus on how collaborative creativity is a part of ongoing projects and work, in section 7.1. The focus in this thesis is on co-present collaborative creativity in practice; meaning collaborative creativity implemented and conducted as creative processes. The core essence of the framework is therefore a description of the creative process including:

- An identification of a general pattern of creative stages, in section 7.2.1.
- A brief description of each creative stage, in section 7.2.2.
- A comparison of the framework with related work by Schneiderman (2002), in section 7.2.3.
- A description and categorization of the main elements and relations constituting co-present collaborative creativity, in section 7.2.4.
- A description of how elements in co-present collaborative creativity are implemented in the process, in section 7.2.5.

## 7.1 Overall structure of collaborative creative work

As mentioned in the initial analysis of collaborative creativity in Oasen: The overall structure of collaborative creative work is divided into three steps: Pre-work, the creative process and postwork.

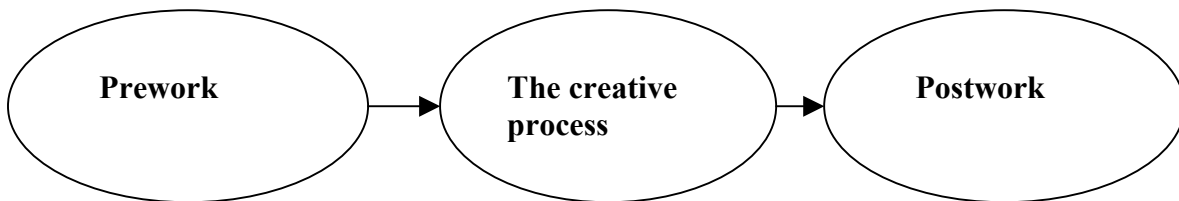


Figure 41 Overall structure of collaborative creative work

### 7.1.1 Prework

Prework involves an initial meeting between the facilitator and the customer where the customer's goals and needs are defined. The facilitator then designs a creative process based on these goals and needs, and his or her experiences with similar processes. The result of the planning is a process plan with an overview of tasks and goals for the creative process, which is used by the facilitator as a work plan during the process. This thesis have not studied the prework in detail, but it seems that this planning can take place where ever it's convenient for the customer to meet, and that it involves a more traditional setting than the creative processes conducted in Oasen. One of the processes analyzed in this thesis, distributed material to the participants previous to the process.

Most of the tasks performed in the prework-stage seem easily supported by the use of ICT tools, but the collaboration occurring in this part of the creative work is not the focus of this thesis. ICT support for this stage would demand a deeper study of the relations between co-present and distributed collaborative creativity.

### 7.1.2 The creative process

The creative process is what has been the focus when studying collaborative creativity in practice. It is the actual implementation and performance of collaborative creativity: Participants, sometimes the customer and sometimes just representatives or staff, physically gathers in the idea laboratory to collaborate in order to solve a task or a problem in a creative manner. The process is lead by a facilitator which introduces them to the goal and the tasks, helps them getting started, keeps track of time and lead the participants according to the process plan.

A creative process is divided into a set of creative stages, as defined in the initial analysis in section 6.2. Observations and analyses of creative processes in Oasen have clarified the structure and the content of these stages, which will be further explained in section 7.2.

### 7.1.3 Postwork

Postwork is work performed after the process. Oasen defines postwork as [Appendix 15.2]:

- Distribution of results: The facilitator distributes whatever might have been documented during the process. Status quo per 2004 is that the facilitators takes digital pictures of the results and distribute them to the customer or to all participants.
- Realization of ideas: If the problem, ideas or tasks performed are important or promising, the participants might continue working on them when returning to their organization or work place.

The potential for using ICT technologies to support and further enhance this part of the creative work seems very promising, but it is not the focus in this thesis.

### 7.1.4 Collaborative creative work as part of larger projects

Collaborative creative work as conducted in Oasen is not solely a single activity just taking place in the idea laboratory. A creative process, or maybe even a series of creative processes, might be part of a bigger ongoing project conducted by the customer. For instance: A business might be working on a project developing a new product and hires Oasen and their competence to help them with creative thinking in one or several steps of the development, as visualized in the model below:

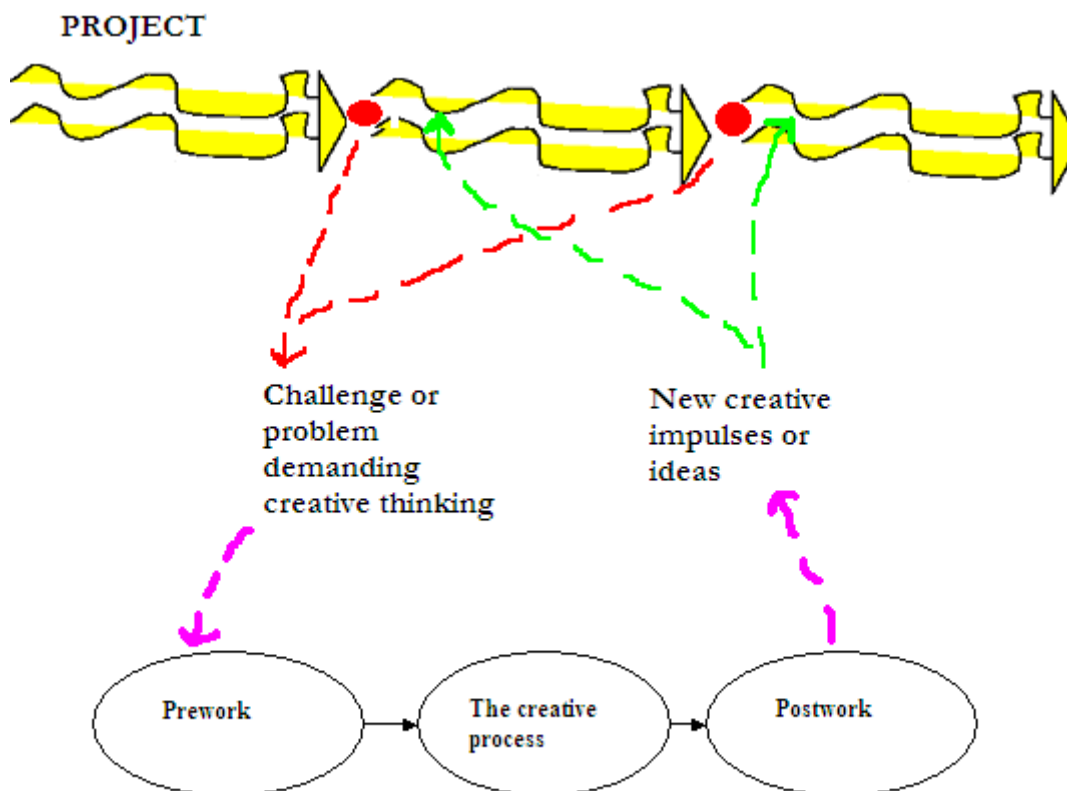


Figure 42 Collaborative creativity as part of ongoing projects

## 7.2 The creative process

Observations and analyses of creative processes in Oasen have revealed the following components in creative processes:

- There is not a fixed set of creative stages, but a general pattern have been revealed, as described in section 7.2.1.
- The content of each creative stage might vary a bit, but a general description is given in section 7.2.2, based on the general pattern described in section 7.2.1.
- The general pattern have similarities with related work by Schneiderman (2002). A comparison of the 3C framework with the collect-relate-create-donate framework is therefore described in section 7.2.3.
- A set of elements constituting co-present collaborative creativity is presented in section 7.2.4, and a description of how these elements are structured and implemented in the creative process is described in section 7.2.5.

### 7.2.1 General pattern

Observations and analysis of creative processes in Oasen reveals that there is no fixed set of creative stages in a creative process, but that there is a general pattern. This pattern is then adjusted to fit each customer's needs and goals, and the available time frame. It is also adjusted to unexpected changes which might occur during the process, such as the discussion which arose in the EIT-process [section 6.3.3].

The model below gives a brief summary of the creative stages in the different processes which have been observed and analyzed. The comparison reveals a general pattern which is the basis in this framework.





Section 6.2.3	1st meeting	SINTEF	EIT	ISFIT	
Arrival	Welcome	Welcome	Welcome	Welcome	→ 1. Arrival/welcome
Goal of the day	Set the stage	Set the stage	Set the stage	Set the stage	→ 2. Set the stage
Opening stage	Introduce oneself	Gather information	Discussion about goals and tasks		
	Individual idea generation	Group idea generation	Individual idea generation	Individual idea generation *	→ 3. Individual idea generation
	Present ideas to the group	Group presentations to the plenary	Present ideas to group	Present ideas to the group *	→ 4. Present ideas to the group
		Plenary evaluation			
Focus stage	Group discussion, concretize and summarize results	Group concretization	Group discussion, concretize and summarize results	Group discussion *	→ 5. Group idea generation: discuss, concretize and summarize results
				"Shake and take"	
				Evaluation	
			Group presentations to the plenary	Group presentation to the plenary	→ 6. Group presentation to the plenary
					→ 7. Evaluation of ideas
Gather and secure results	Discuss further work	Reflection	Plenary discussion	Reflection	
Landing	Digitalize and save results	Summary		Summary	→ 8. Reflection, summary and further work

\* = recursive

Figure 43 Summary of creative stages in creative processes

The general pattern described above is a structuring according to which tasks are performed during the creative process. One can also structure the stages according to which working modes is being used:

- Individual work
- Group work
- Plenary work

Individual work is when each single participants is working on their one. For instance, in an individual idea generation stage or when doing individual reflections.

Group work can be both the whole group working together or pairs or subgroups working. For instance can it be the whole group working on summarizing the group's results and presenting them to the plenary. And it can be pairs or subgroups working together in concretizing certain ideas or making a presentations of the results.

Plenary work is when all participants act as one single group. For instance, when arriving and when the facilitator gives the instructions, or when performing energizers or ice-breaking games.

It can be difficult to define and draw the line between the different work modes. For instance; A group presenting their ideas to the other groups, might be considered a mix of both individual work, group work and plenary work. One might say that the group presenting is doing group work, if there are several group members collaborating in doing so. If not, one might define it as a individual work, if there is only one group member doing the presentation. And one might define it as plenary work, considering that it the rest of the participants are listening and maybe even taking notes. In this framework, the definition relies on which is the main performer of the task; the individual, the group or the plenary. As in the example described; a group presenting something would be considered group work if several of the group members collaborate in doing so.

An example of how it is possible to structure the creative stages according to work modes is by looking at the creative stages in the EIT-process, as described in section 6.3.3.:

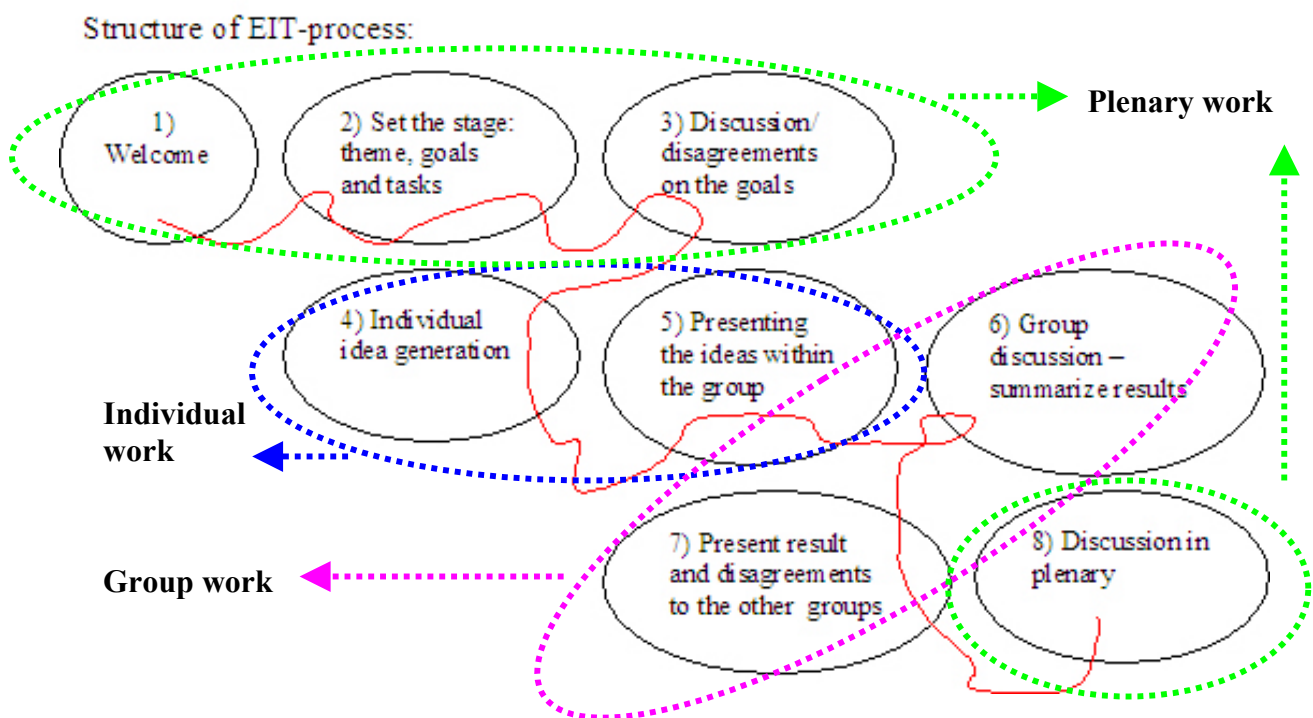


Figure 44 Work modes in the creative process

The EIT-process starts with plenary work, goes on with individual and group work, and ends with a plenary discussion. This seems to be a general pattern, and the analysis of the other processes observed reveals that a creative process always starts and ends with plenary work.

Most processes seems to involve both individual and group work, where the individual work mainly consists of individual idea generation and presentation, and group work mainly consists of discussions connected to concretization of ideas, the making of results and presenting these to the other participants. Most processes therefore fits in the general pattern presented in the model below:

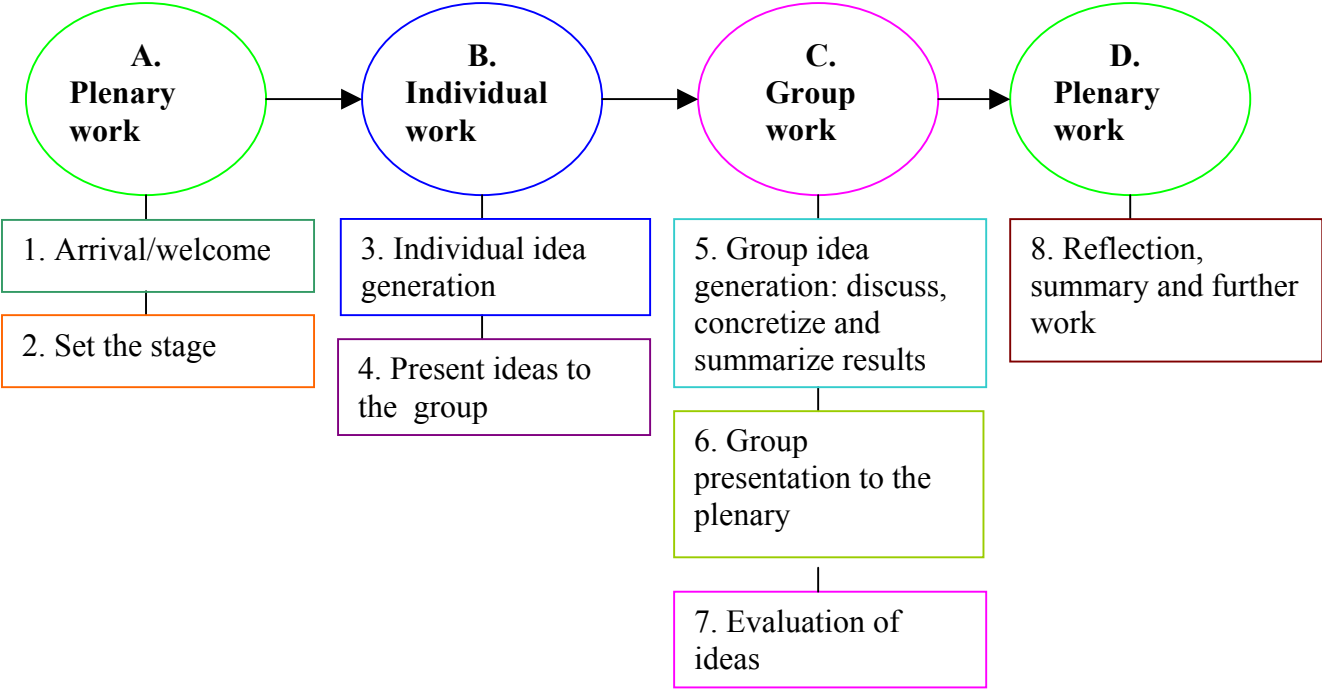


Figure 45 General pattern: creative stages in creative processes

The creative process always starts with stage 1 and 2. Stage 3-6 might be recursive:

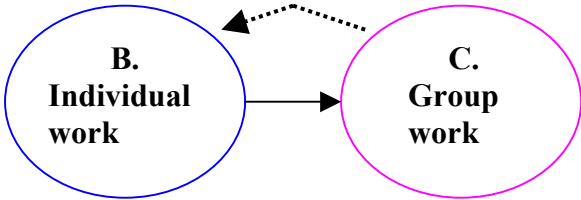


Figure 46 Recursiveness of creative stages

One might have stage 3-4, 3-5, 5-6 occurring several times during the same process, which was the case in the ISFIT-process described in section 6.3.4. Stage 7 might occur before or after stage 6 - the group presentation to the plenary, and sometimes as a plenary task before stage 8. Stage 8 is always present as the last stage in the process, but the content in this stage can vary a bit. A further description of each creative stage is given in section 7.2.2.

The model of the general pattern describes how the creative work is structured as creative stages in a creative process. Connecting this pattern with the overall structure of creative work defines a structural framework for co-present collaborative creativity, as presented in the model below:

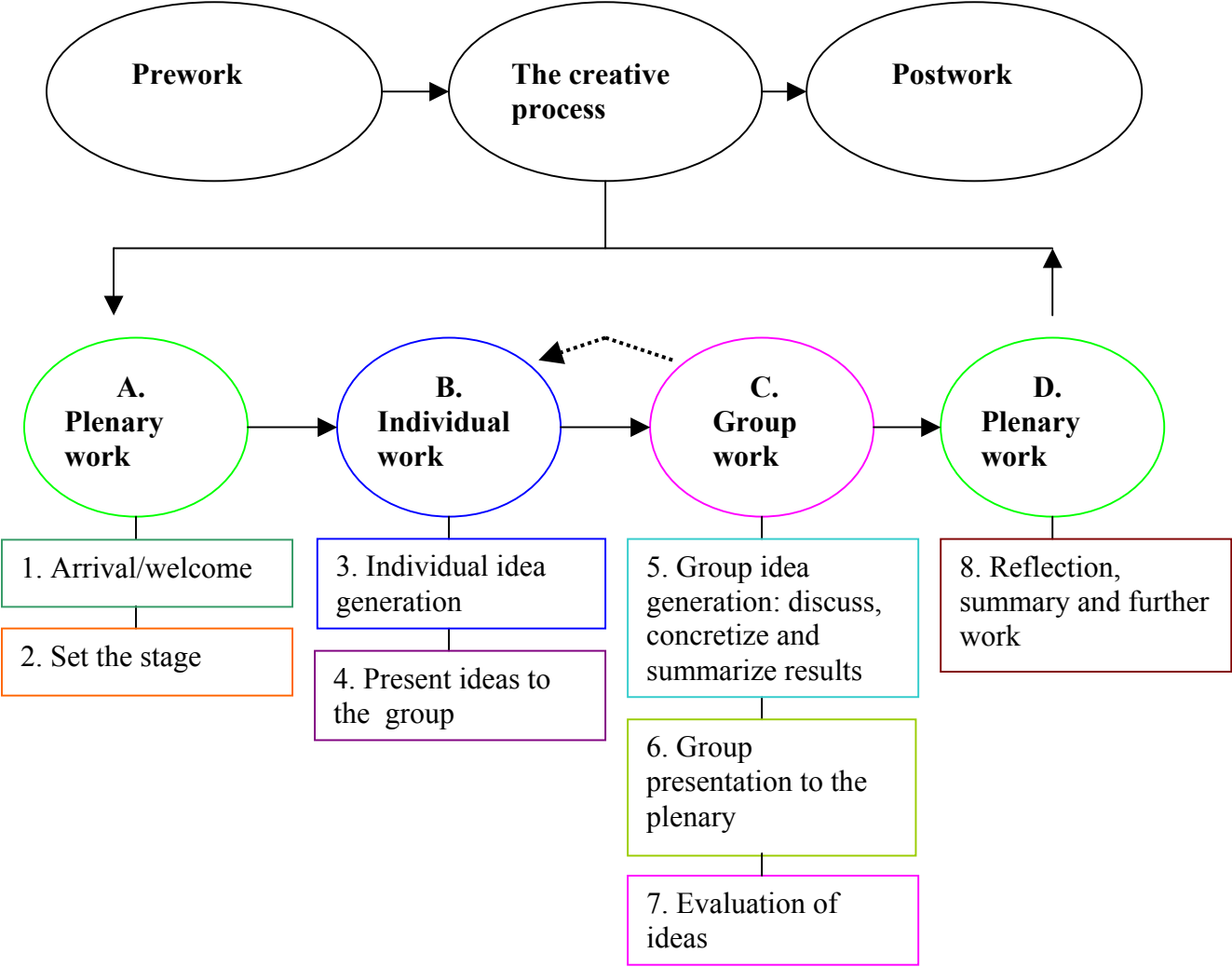


Figure 47 General pattern: Co-present collaborative creativity

## 7.2.2 Descriptions of the creative stages

A brief description of each creative stage is given in this section, with emphasis on information sharing and which tools, mechanisms and creative methods that occurs in the different stages. The descriptions are based on the general pattern described in section 7.2.1, which involved the following eight stages:

1. Arrival and welcome
2. Set the stage
3. Individual idea generation
4. Present ideas to the group
5. Group idea generation: discuss, concretize and summarize result
6. Group presentation to the plenary
7. Evaluation of ideas
8. Reflection, summary and further work

### 1. Arrival and welcome

This stage is used as an informal identification stage where you identify who the other participants are, maybe greet people. It is also an important stage in the process in order to make the participants feel comfortable; giving them time to adjust to the creative setting and hopefully trigger their curiosity. The stage involves:

- a. Arriving at Oasen, taking off your shoes and walking into the creative room.
- b. Greeting the people there.
- c. Finding a place to stand or sit.
- d. Usually serving of coffee or tea.

No creative methods are used in this introductory stage. The only tool used is the physical setting with its interior and furniture in order to trigger curiosity and create a welcoming and positive atmosphere.

### 2. Set the stage

This stage is about creating a common understanding of why the participants are gathered: The theme or problem, participant's expectations, customer's needs, goals, etc. The stage involves a verification or a clarification of goals and needs, according to the prework. The facilitator introduces the theme, the tasks and a plan for the process. Instructions are handed out and/or visualized, and the participants are divided into groups and assigned a work space. If needed, the facilitator gives instructions on how to use certain tools or help clarify the tasks in order to get the participants started.

Tools used for information sharing are blackboards for visualizing instructions, and A4 sized white papers with typed text which is handed out to each group or each individual. Verbal language and gesticulations is the most important communication tool.

Furniture is arranged to define each group's work space in the room, and sometimes color schemes are used to identify each group with different colors.

The work mode is plenary throughout most of the process; The facilitator is the focus point announcing everyone and explaining things in plenary. Then at the end of the stage, the participants are divided into groups, normally 3-6 people per group.

### **3. Individual idea generation**

Oasen themselves describes this stage as “...an opportunity to perform creative methods that stimulate the perceptual, visual and spatial dimensions. These methods are meant to trigger the exploratory interests and skills, and opens up for a comprehensive use of associative and metaphoric thinking. This stage supports original, energy-high, ingeniously, strange and surprisingly initiatives and inputs. Also referred to as the idea generation stage.” [B]

No information sharing occurs in this stage. This stage can be compared to Schneiderman’s collect-relate-create activities: The individual collects stimuli from the environment, relates different impulses and associations and create ideas. For instance can a picture of Chinese people on bicycles trigger your association and you get a brilliant idea for a new product for the Asian market.

The focus of this stage is stimulating the individuals to think creatively. That means a focus on tactile input and visualization in order to trigger associations and playfulness. Tools used are pictures, odd artifacts and toys, clay for modeling, paint, paper and color pencils.

### **4. Present ideas to the group**

This is an important stage where each individual is given the chance to present their ideas to the rest of the group. Oasen focuses very much on democratic communication: Allowing everyone to communicate their ideas to the others by using tools which supports that, and different mechanisms and creative methods forcing everyone to do so, such as the method talking-stick.

This stage is very similar to what Schneiderman (2002) describes as ‘donating’, where the individual is sharing their ideas with the world. It can also be described as ‘collecting’, but then in a group context: The group ‘collects’ ideas from the individuals – generating new ideas through collaboration.

Tools used for this information sharing stage is based on which tools was used in the idea generation: If one have modeled their ideas in clay, then one uses the model for visualizing when verbally explaining their ideas. If one has paper and color pencils to draw and write, then one uses the paper to visualize when explaining verbally. This stage therefore involves tools visualizing the results from the previous stage in connection to verbal explanations.

### **5. Group idea generation**

This stage involves a group discussion: Generate new ideas based on the ideas presented in the previous stage, comparing alternatives, choosing the ideas one like the best and concretizing them. Then based on variations in time limitations and customer needs and goals, the participants either focus on further development and concretization of the ideas, testing or problem solving.

If compared to Schneiderman’s framework (2002), this stage involves ‘relate’ and ‘create’, but within a group context: It is not the individual mind trying to relate memories, associations and ideas, but individuals collaborating and even physically trying to relate each others contributions to one another. And by doing so; creating new ideas.

In this stage of the process there is a need for a shared workspace in the group. Tools used are therefore tools providing large spaces, or tools that enable modification or combination of results. All processes observed used white posters or blackboards as tools in this stage.

Some processes used colored post-it notes for representing ideas in the shared work space. The purpose is having easily manipulative tools which enabled shuffling around and combining different alternatives and groups of ideas. These tools also seemed to support identification; the handwriting could identify whose idea it was, and different creative methods could force a democratic communication and sharing using the post-it notes as representatives for each individual.

In some processes, such as the ISFIT-process, this stage might also include and start with a so-called ice breaking game. It is a simple game conducted by the participant in order to 'break the ice' and get people comfortable around each other: Get them to open up, share ideas, communicate and trust others. sdfd

## **6. Group presentation to the plenary**

The purpose of this stage is very similar to stage 4; 'donating' your ideas and results to others (Schneiderman, 2002). In a group context; this means donating the results to the plenary.

Similarly to stage four, tools used supported visualization of ideas and results, accompanied with verbal explanations. Again; which tools was used depended on which tools was used in the previous idea generation stage, but most processes observed used large posters displayed on the wall.

## **7. Evaluation of ideas**

This stage involves an evaluation of ideas or results. This evaluation can be done between different stages in the process. Analysis in section 6.3 revealed different types of evaluations:

- a. Plenary evaluation of one group's ideas after each group's presentations of ideas – evaluation as feedback on the presentation [SINTEF-process].
- b. Evaluation as part of plenary discussion directed by the facilitator [EIT-process].
- c. Evaluation of the group's ideas or results within the group, before presenting the results to the plenary [ISFIT-process]
- d. No evaluation at all or evaluation considered to be an integrated part of group discussion and concretization of ideas [1<sup>st</sup> meeting-.process].

## **8. Reflection, summary and further work**

At the end of the process the focus is on taking care of and securing the results from the process. Documenting or storing necessary information for further work, and maybe plan how to follow up or implement the results.

Everyone is given time to reflect upon the many ideas and impressions they've experienced during the process. The goal is to catch those ideas or comments that otherwise would be lost in the bustle of finishing the day.

The content of this stage vary a bit according to customer goals and needs, size of the project and 'problem', and time limitations: Sometimes the focus is on individual reflections. Sometimes on gather and secure results in order to have some material to continue working on and defining further work; how to proceed, who does what, etc.

Short reflections can also be connected to specific tasks or problems can be conducted in between different stages if needed, as was the case in the ISFIT-process with recursive stages including three group work sessions with results.

### 7.2.3 A comparison of the 3C framework with Schneiderman's framework

A comparison of the 3C framework presented in this thesis and the framework defined by Schneiderman (2002) is presented in the figure below:

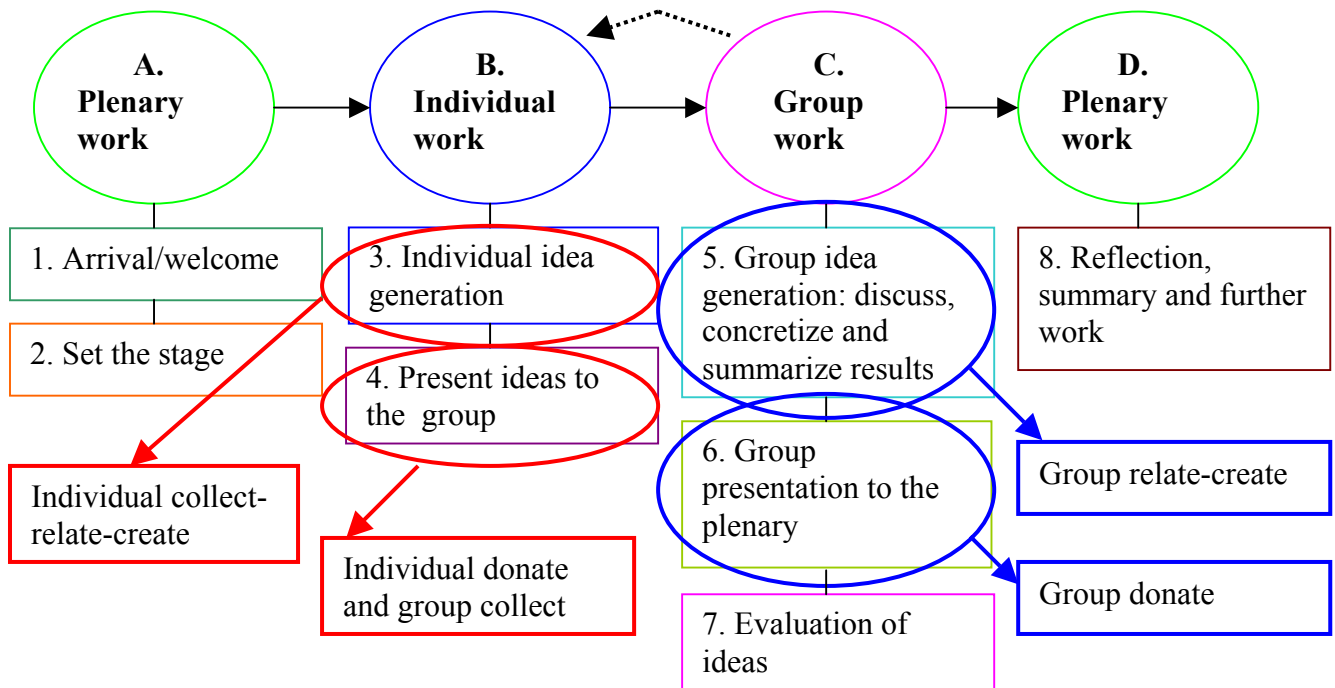


Figure 48 Comparison of the general pattern with Schneiderman's framework

The four activities; collect-relate-create-donate, can be implemented in co-present collaborative creativity both within an individual context and a group context. The individual as the creative person can collect creative stimulation from the environment, relate memories, associations and thoughts, and create brilliant ideas which then are donated and shared with others. That is how Schneiderman defines the implementation of these four activities from a system-oriented view on creativity. But; these four activities can also be applied in a group context; The group collects ideas from the individuals, ideas are related through categorizations and new ideas are created based on these relations, and ideas and results are then donated and presented to others.

### 7.2.4 Elements and relations constituting co-present collaborative creativity

The previous sections have defined the structure in co-present collaborative creativity. This section describes and clarifies the tools used and the somewhat more abstract elements constituting co-present collaborative creativity; the mechanisms and semi-mechanisms needed in order to enable and support creative thinking, as initially described in section 6.1.



Observations and analyses of creative work in Oasen have identified the following mechanisms, semi-mechanisms, tools and relations in co-present collaborative creativity:

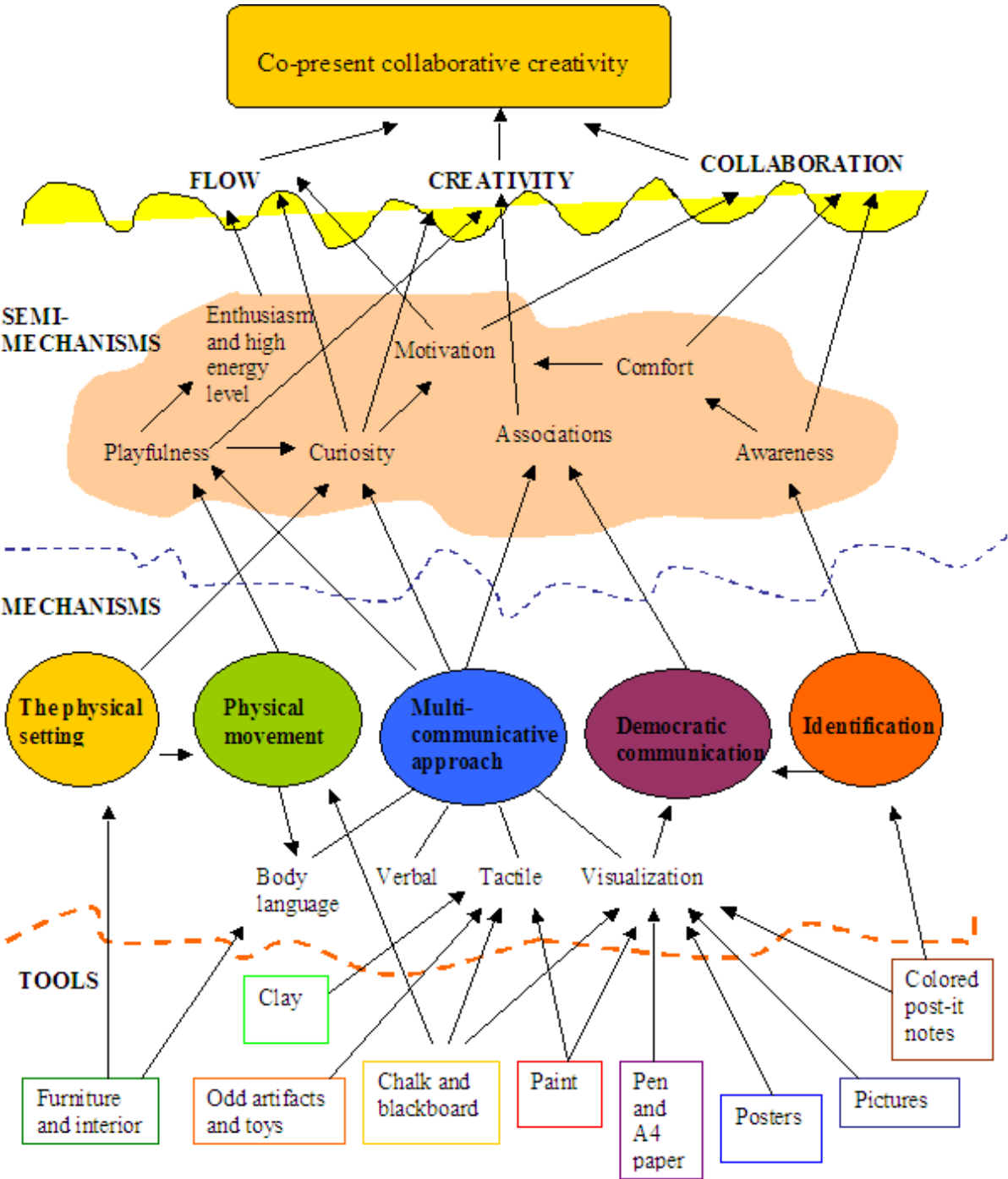


Figure 49 Elements in co-present collaborative creativity

Co-present collaborative creativity is constituted by three closely intertwined elements: Creativity, collaboration and flow. In order to enable and support these elements one must support a set of mechanisms and semi-mechanisms. Mechanisms and semi-mechanisms are abstract elements describing how to think or act in order to enhance, stimulate or support collaborative creative thinking. For instance how one should communicate with one another in order to stimulate idea generation.

#### 7.2.4.1 Mechanisms and semi-mechanisms

The mechanisms identified through analyses and observations in Oasen are:

1. The physical setting
2. Physical movement
3. A multi-communicative approach
4. Democratic communication
5. Identification

**The physical setting** is important in order to:

- Enable physical movement of participants
- Visibility of tools and opportunities in the room. For instance, displaying tools and toys in order to stimulate curiosity.
- Creating different types of work spaces; individual, group and plenary. For instance, moving the furniture around to arrange a plenary seating versus a group seating area.

**Physical movement** is important in order to:

- Make people use their body language more when communicating – supporting a multi-communicative approach
- Stimulate curiosity and playfulness, and through such enhance enthusiasm and motivation.
- Support the notion of flow.

**A multi-communicative approach** is important in order to:

- Stimulate ideas by stimulating associations. For instance, Oasen believe in tactile input in order to stimulate the senses.
- Support communication and information sharing by communicating using several communication channels.
- Help people in conceptualizing: Understanding and concretizing their ideas.

**Democratic communication** is important in order to:

- Support idea generation by supporting a greater sharing of information: Making sure that all ideas are presented, that everyone contributes. A greater variety of ideas in the group might trigger the association and generate more ideas.

**Identification** is important in order to:

- Support awareness; knowing who is who, and a feeling of group belonging by identifying both individuals and groups, which again might support a feeling of comfort.
- Identifying individuals and their work might support democratic communication and sharing. It's easier to collaborate when you have some sort of 'bonding' or connection to the ones you're collaborating with.

The observations and analysis of creative processes in Oasen, as described in section 6.3, have very much verified the analysis conducted in section 6.1. The only new element identified was the use of ‘identification’. Participants were given dedicated time and tasks in order to get to know each other and be able to identify each other: This was for instance done by using colored post-it notes as name tags; showing each participant’s name and group belonging. Identification is defined as a mechanism in the model, supporting awareness, which is defined as a semi-mechanism. A multi-communicative approach was further divided into four communicative aspects: Verbal language, body language, tactile input and visualization.

Semi-mechanisms are very abstract elements related cognitive abilities and people’s feelings. They are not further defined in this thesis since they seem to be a bit out of my field of knowledge and research, but they are identified and described as an important part of co-present collaborative creativity.

#### **7.2.4.2 Tools**

A more easily recognizable and descriptive part of the collaborative creativity is the tools used. These are physical elements used in order to support different mechanisms and tasks. The observations and analyses didn’t reveal any new tools, but identified that certain tools was used more often than others, and that some tools were used to support very specific tasks or mechanisms:

- Furniture and interior was used for three purposes:
  - Enabling physical movement of participants
  - Establishing different work spaces for different work modes
  - Stimulating the senses and trigger curiosity
- Odd artifacts, toys and pictures were mainly used for stimulating curiosity, playfulness and associations through tasks including metaphoric thinking. Sometimes used as part of installations and models.
- Post-it notes were used as identification tags, and for visualization and categorization of ideas.
- Most of the tools were used in order to support visualization, such as blackboards and posters. Some of the tools were used in order to stimulate the senses through tactile input, such as painting with your fingers or modeling with clay. Few tools directly supported the use of body language, but most of them have a size that enables physical movement of the users or the tools themselves.
- The tools used the most were surprisingly enough paper; A4 sized paper and posters. Paper doesn’t seem very creative compared to some of the other tools, but this seemed to be the tool best suited for conceptualization, communication and information sharing. It was used for: giving out instructions, individual idea generations and information sharing, group conceptualization, categorization and concretization, and group presentations – in other words; it was sometimes used throughout the entire process.

The model shows the main relations between the elements. For instance that using chalk on blackboard supports tactile input and visualization, which might trigger one’s associative abilities or enhance playfulness, and further enhance creativity and flow. The relations considered most important in order to introduce technology support is the relations between the tools and the mechanisms, as briefly described in the model and this section, and previously exemplified in section 7.2.2, and as initially defined in the analysis in section 6.1.

### 7.2.4.3 Other important elements

Other important elements constituting co-present collaborative creativity are:

- **The facilitator** conducting the creative process; either a professional facilitator such as in Oasen, or someone leading a project team or a group where the focus is on the process and not solving tasks or producing results.
- **The customer**; the one(s) who defines the ‘problem’, goal or needs.
- **Structural elements** such as **creative stages**, **creative methods** and **work modes**: Structuring and forming which mechanisms, tools and people to put together in a task in order to reach a specific goal or result.

These elements are further described in the categorization in section 7.2.4.4, and in the description of how the elements are implemented in the creative process in section 7.2.5.

### 7.2.4.4 General categorization of elements

Co-present collaborative creativity includes a mix of creative thinking, collaboration and flow. This type of creativity is enabled and supported through a set of mechanisms and semi-mechanisms. It is quite difficult to identify and describe these mechanisms as singular objects, as described in the analysis in section 6.1 and 6.2, but I have made an attempt in doing so in the previous sections: Describing the mechanisms and the relations between them, and which tools can be used for supporting them.

The mechanisms and the relations identified in this framework and in this thesis may vary for other cases, but a general conclusion can be drawn: There exists a set of intertwined mechanisms and semi-mechanisms constituting co-present collaborative creativity, which one must identify and define in order to find suitable tools supporting them.

A more general categorization is described below in order to help designers to define the elements constituting co-present collaborative creativity:

The elements can roughly be categorized in three groups forming a creative triangle:

1. *Physical elements*: Tools; both communicative tools and furniture, results and people
2. *Structural elements*: Creative methods, creative stages and work modes.
3. *Abstract elements*: Mechanisms and semi-mechanisms enabling and supporting collaborative creativity, such as visualization and democratic communication.

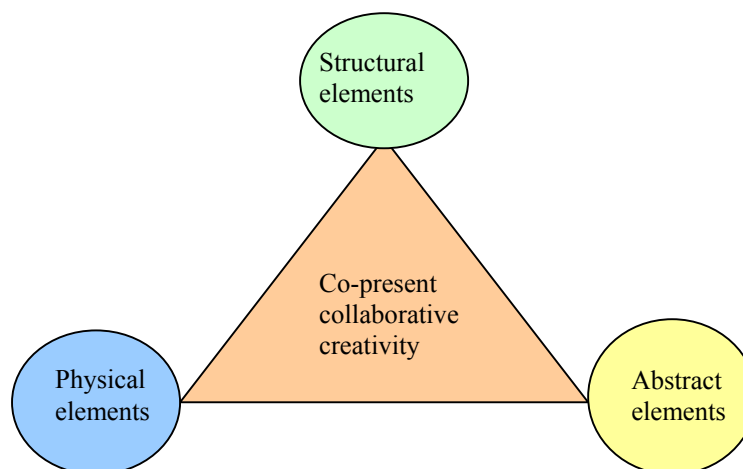


Figure 50 Categorization of elements in co-present collaborative creativity

### 7.2.5 How the elements are implemented in the creative process

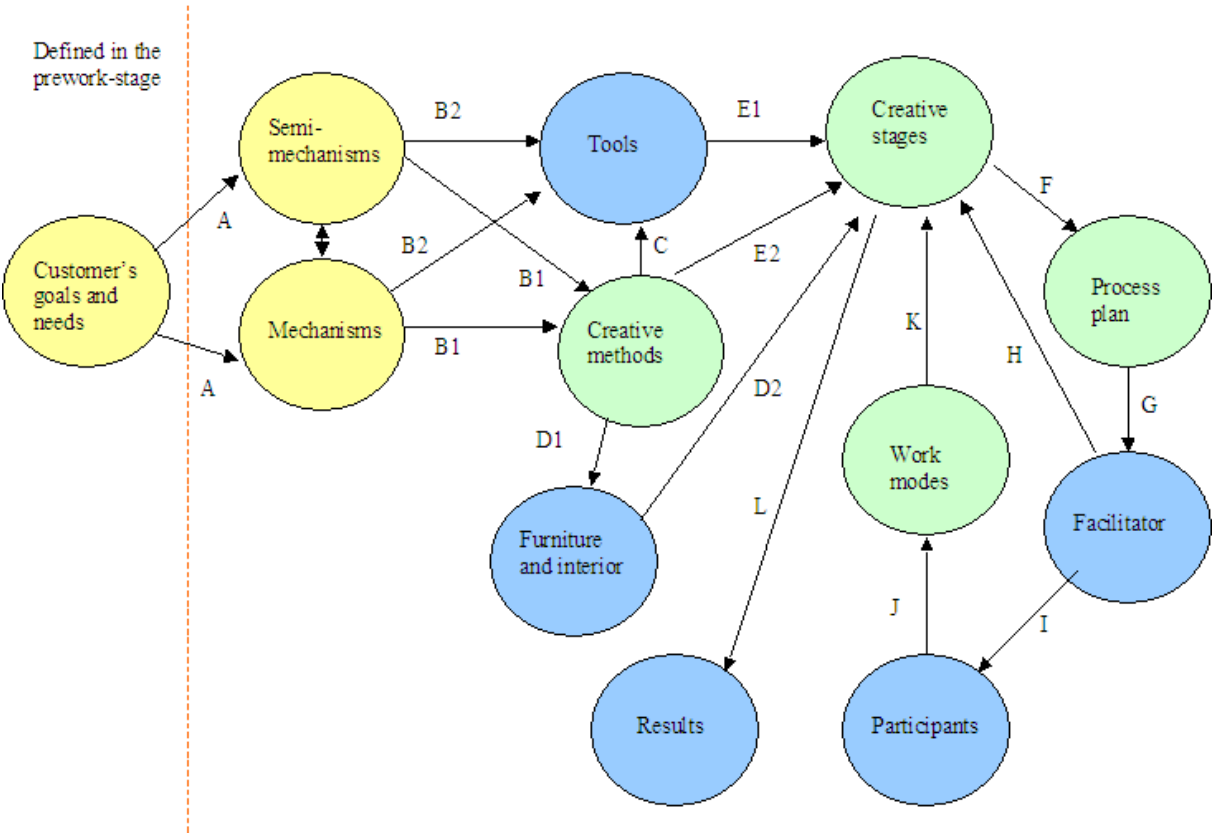


Figure 51 Implementation and structuring of elements in the creative process

The model above is a description of how the elements in section 7.2.4 are implemented and structured in a creative process. This implementation means a connection of abstract elements (yellow) with physical elements (blue) and structural elements (green). Abstract and physical elements such as the mechanisms and tools were described in section 7.2.4. In addition to the tools and the furniture, there are two very important physical elements: The participants and the facilitator – the ‘users’ of the other elements. All abstract and physical elements are implemented in the process through structural elements such as creative stages, creative methods and work modes. A more thorough description of the connections between the elements is given below:

The customer’s needs and goals is the starting point for every creative process; one must define a ‘problem’. These goals and needs influences to a large extent the content and elements chosen for the creative process:

The customer’s goals and needs affect the choice of which mechanisms to emphasize in the process (A). For instance, if the goal is team building one might focus on identification and comfort as mechanisms in order to establish a group feeling and bonding. If the goal is to get ideas for product development, one might focus on visualization in order to conceptualize the ideas, or democratic communication in order to support idea sharing.

Which mechanisms one chose to focus one, then affects the choice of tools and creative methods (B). For instance, if one chose to emphasize democratic communication, then it would be natural to choose a creative method like “Talking stick” (B1), which would involve using a pen or a stick to pass around (B2, C).

The creative methods and the tools, including furniture and interior, chosen based on which mechanisms one wants to emphasize, are then structured as a set of creative stages (E1, E2, D2). An overview of how these creative stages are put together in the process is described in a process plan (F), which is then used by the facilitator (G) during the process as a work plan in order to run the process: Keeping track of time, organizing and leading the participants (I), and making sure each creative stage is conducted as planned (H).

The participants engage in each creative stage (K) through different work modes (J). Some stages demands just plenary work, while other stages might involve a mix of both individual and group work.

The participants create different results throughout different creative stages (L). For instance, after an individual idea generation one might have a set of abstract ideas and a few concrete points visualized by tools. This can be viewed as a part result in the process, whereas the final results normally would be referred to as the group’s summary.

## 8 Facilitators perspective on ICT in Oasen

This chapter is part of the result from interviews with three facilitators in the spring of 2004. All quotes without references in this chapter are citations from these interviews. Instead of referring to the facilitators' names, I choose to refer to them by the collective term 'Oasen'.

### 8.1 Status quo, needs and goals

Oasen have decided that it's time to investigate how ICT can contribute to a positive improvement of the creative work. Oasen uses a whole range of analogue tools like paper, chalk and blackboards, and they have developed a very high competence in collaborative creativity using such tools. These tools are very well integrated in their creative methods and their creative work, but Oasen is starting to see the need for digital tools due to affordances like digital storage and distribution, but also in order to enhance creativity in itself.

Why now? Oasen claims that *"it [ICT] has been topical for quite some time"*, but they haven't started using ICT-tools as a fixed part of the creative work because they wanted to develop the creative part of it first. *"We need a professional foundation within the discipline."* They claim that there's mainly practical reasons why ICT has not been introduced in their work. Among other thing is the fact that there hasn't been *"time to prioritize it."* But they definitely see many advantages of doing so: *"we think that there are advantages concerning several things."* They assume that ICT will lead to higher efficiency; that it will ease the work of the facilitators and reduce the cost for customers. And that ICT will increase the quality of the work.

Initial goals are to:

- Expand the methodic repertory and the practice that Oasen represent
- Acquire tools that creates a greater 'bloom' of ideas
- Acquire tools that ensure a greater continuance and larger probability of realization of ideas

Oasen needs a set of tools that can:

- Capture and store the results of the creative processes digitally in order to enable distribution and editing of results after the creative processes
- Support idea generation
- Support concretization of ideas

A more detailed description of needs will be defined in chapter 11, defining requirements and implications for the design and introduction of technology in creative work.

## 8.2 Requirements for design and deployment of ICT tools

In the interviews, I asked the facilitators about their thoughts on which technology could be used in Oasen and what potential problems or challenges they saw in integrating/bringing ICT in the creative work. My goal was to detect a few criteria for which type of technology should be considered. And in addition, through the facilitators view get a better idea of how ICT could be integrated, for what purpose and how.

### 8.2.1 Maintaining creativity as the center of attention

It is important for Oasen to maintain the creative work as the center of attention, and they view ICT as a remedy that can be used to improve or simplify this work; *“to use ICT as a remedy to generate creative results.”* It is therefore important that the ICT-tools are adjusted to their creative work, and not vice versa.

One of the greatest challenges is, according to Oasen, how to introduce technology without taking the focus away from the creative work. They want technology to be *“integrated as much as possible.”* Oasen wants the technology to be integrated in the physical setting, so that it becomes *“a part of the room. As if it’s just a white sheet there. That doesn’t interfere.”* This is particularly important because the content and the users of the creative processes vary a lot from time to time. The integration of the technology becomes *“very important since it’s a multi-user setting.”* The challenge is therefore to integrate the technology in a way that makes it both easily accessible and ‘invisible’ in many different situations and settings. The technology should not obstruct or take the focus away from other activities. Oasen wants it to *“lay as a possibility in the room in the same way as other things.”* They fear that the technology will take the focus away from the creative because they think the physical tools will act as a disturbance: *“Then it will be THAT it’s centered around, and nothing else.”*

### 8.2.2 User friendliness

Another potential challenge is *“user entry level! That is a certainty!”* Technology needs to be reliable and *“intuitively very easy to use. It must be something that is extremely easy... Like a white sheet. That you know what to do with.”*

Oasen’s argument is that their users are all kinds of people with very varying degrees of technological knowledge and experience. The most important part of the creative work is getting positive or valuable results. They already have to cope with a few barriers in order to do so; like negative attitudes, time and money. They don’t want another barrier in technology. With the limited time available for the physical gathering in Oasen, they just don’t have *“time or resources enough to start experimenting. With those customers we have, we just can’t.”* It is expected that each process creates results, and that means that they can’t waste any valuable time on understanding technology or solving technical problems. It is very important that any potential technology is highly user friendly, both in term of the diversity of users, but also considering the facilitators’ time and skills.

Rather than having a high degree of functionality, Oasen wants technology that is easy to use. The user interface has to be *“very simple. That is perhaps more important than being able to all sorts of things.”* Oasen prefer to have *“several different ICT widgets with quite specified functionality, rather than having one that does it all.”*



### 8.2.3 Flexibility

It is important for Oasen that the technology is flexible: Both when it comes to shape and visibility: That it can be both 'visible' and 'invisible' in the same setting, but also considering the support of flexibility and improvisation that often needed in creative work:

Oasen needs to be flexible in how they perform their creative work: There's a lot of improvisation in creative interaction; *"little things you have to deal with spontaneously."* Therefore you have to be able to change the course of the work as you go along. This means that there must be a flexibility in which tools and interfaces you use, and that it must be possible to easily transfer your work from one tool or interface to another. A creative process consists of several stages where each stage usually has a result, which in some form must be transferred to the next stage of the process: *"Different stages needs different types of support and different types of tools."*

### 8.2.4 Supporting flow

Physical movement and 'creative flow' is important for Oasen's creative work. It is therefore very important that the technology is both very user-friendly and works as an integrated part of the setting, so that it doesn't disturb the participants 'creative flow'.

It is also important that the tools support mobility. In this case what Luff and Heath calls micro-mobility (1998): They want tools that are easily transportable within the room and movable within the working area of each user or group. For instance artifacts that they can pick up, hand over to others, carry with them in the room, shuffle around, etc. Oasen also want a technology that enables several people to use the same tool at once – so-called multi-user input. Oasen wants to keep all the participants active at the same time. They don't want a group of people sitting in front of a computer where only one of them can interact and perform at the time: *"...when you have that flow, when things go automatically, and then...you have to sit down and write on the computer or something. You get this break in the rhythm. I must honestly say that I'm worried about that."* Oasen most definitely don't want any stationary computers, but rather tools that support physical movement and mobility of people within the setting.

Most software are build up by procedures and steps, and one of the facilitators in Oasen mentions that he fears that many of the existing tools and software are constructed in such a way that they won't work in a creative setting: *"Just pick any kind of ICT-tool and ask questions about which procedures it is based on and which premises there is for using it. A huge amount!"* Oasen claims that creative processes not necessarily, or rarely, have the same procedural steps as the tools, and that using such tools could rupture the creative flow. Creativity involves impulsiveness and different lines of thinking: Looking at different alternatives rather than following procedural steps from A to Z. Oasen would like to *"avoid the procedures, because the procedures don't just affect the process, but the results as well."*

## 8.2.5 Summary of feedback from facilitators

Oasen needs a set of tools that can:

- Capture and store the results of the creative processes digitally in order to enable distribution and editing of results after the creative processes
- Support idea generation
- Support concretization of ideas

A requirement list is made as a summary based on the feedback from the facilitator's. The list contains points to consider when looking for potential tools for Oasen. The requirements will be further studied and clarified through testing of tools, as described in chapter 9 and 10, and then used as the basis for the guideline in chapter 11.

Requirements for tools supporting co-present collaborative creativity:

1. **Maintaining creativity as the center of attention and keep ICT as a remedy.** This can be done by **integrating the technology in the physical setting** so that it doesn't intrude. By choosing tools whose design can make them 'invisible' in the environment and whose appearance isn't breathtaking, but functional for its purpose.
2. **User friendliness**
  - The tools have to be easy to learn and use for all type of users.
  - Oasen wants several simple tools with low functionality, rather than one tool that does it all.
3. **Platform and software independency**

In order to support flexibility and improvisation, the technology and tools introduced in Oasen needs to support both platform and software independency.
4. **Using multiple tools** with low functionality, which can be used for specific tasks or parts of the creative process – in order to support improvisation and flexibility, and user friendliness.
5. **Support creative flow:** Make sure that the technology doesn't stop the creative flow of mind or body. This can be done by supporting:
  - **Non-intrusive** technology, which is to a large extend obtained by supporting integration, flexibility and user friendliness
  - Multi-user input
  - Mobility and lightweight tools
  - **Non-procedural tools**

All in all, it's very important for Oasen that the physical design of the tools and the integration in the setting is very important: *“If the point is getting ideas or forming a group, then it must run so smoothly that it [the technology] doesn't become intrusive.”*

## 9 Testing PDAs and electronic whiteboards

The testing of electronic whiteboards and PDAs were conducted as an exploratory study based on initial observations and analyses conducted in the spring of 2004. The testing was planned and conducted by Ole Sommerin Herbjørnsen, diploma student during spring 2004, and one of the facilitators at Oasen. My part in this testing was to participate in the process; try out, observe and evaluate the use of the tools.

The process plan and the results from the testing are well documented in the thesis of Herbjørnsen (2004): "Exploring ICT support for creative processes." The results described in this chapter are therefore a short summary of the results most relevant when defining requirements for designing computer tools supporting co-present collaborative creativity.

The results are based on observations, video recordings, a group evaluation of the tools as part of the process, and a survey conducted by Herbjørnsen (2004). Citations in this chapter are taken from the survey (Herbjørnsen, 2004: Appendix D).

### 9.1 Why PDAs and electronic whiteboards?

The tools were chosen based on promising results from research on collaborative tools in the merge of CSCW and ubicomp, as described in chapter 3, and based on initial requirements and needs in Oasen defined through observations and analyses in the spring of 2004.

#### 9.1.1 Considering PDAs

PDAs were chosen for testing in Oasen because the tool seemed to fulfill many of Oasen's needs and requirements:

- PDAs are small devices which can be **easily integrated** in the environment: It can be hidden in a drawer or put in the shelf together with the rest of the tools, toys and odd artifacts. It would not act as a disturbance in the creative setting.
- Due to the small size of the tool, the PDAs are highly **mobile and lightweight** tools which can be easily carried around in the room. It is therefore assumeable that it supports **physical movement** of the participants.
- The PDAs has a potential for supporting **information sharing**: It has an IR-function which enables transfer of files and information between sets of PDAs and PCs.
- The functionality and design is very similar to other standards, such as the design and functionality of PCs and mobile phones. It is therefore assumeable that PDAs are just as **easy to understand and use** as the similar technologies.

The PDAs were chosen mainly because of its size, pen-based functionality and its potential in supporting information sharing by using IR-functionality. Prior research have identified the small displays of the PDAs as constraining in creative work, but also claims that they give a positive attribution when connected to other devices (Inkpen et al., 2002). Due to these possible constraints concerning display size and support for visualization, electronic whiteboards were also chosen to be tested, as described in the next section.

### 9.1.2 Considering electronic whiteboards

As mentioned, the electronic whiteboards were chosen for testing in Oasen mainly due to their large **display size**, and therefore showed a great potential for **supporting visualization**. It was assumed that the electronic whiteboards could replace the usage of projected images, as used for instance in the SINTEF-process, and in addition add new **interactive features**.

The electronic whiteboards supports a large range of interaction possibilities: regular keyboard and mouse input, pen-based input with a set of color pencils used directly on the display surface, and touch screen interaction supporting handwriting with your bare hands. It was therefore assumed that it might also support **a multi-communicative approach**, with emphasis on both visualization and tactile input.

The size of the board didn't speak for its advantage concerning integration in the environment, but there are different configurations available including the ones we used for the testing, which was equipped with wheels so that one could move them around and put them away if not needed. The size did however have its possible affordances as well: Apart from the display size as mentioned, it was assumed that it might also support **the physical movement** of the participants: A large interactive board meant a large working surface enabling several people to approach the work space from different angles. That also made us assume that it might be highly supportive of **group collaboration**; assuming it would support people working together on the same task in the same workspace. Research have shown that shared displays might **make sharing easier** because one don't have to intrude any personal spaces (Stewart et al., 1999).

## 9.2 The setting

The objective of the testing was to study the use of electronic whiteboards and PDAs to find out if the tools potentially could be used in creative processes in Oasen, and possibly how. The process took place in June 2004 at Oasen, NTNU. It was a three hour process with four participants divided into two groups, where each group consisted of one facilitator and one student.

The tools used were two electronic whiteboards connected to projectors and PCs using custom software, and four PDAs with integrated IR-functionality and pen-based input. For more information about the setting, such as the setup of the technological equipment, see Herbjørnsen (2004).

The creative process involved five stages:

1. Introduction to the process; the intentions and the goals.
2. Set the creative stage and get to know each other – using the PDAs
3. Explore, share and create together on the whiteboard
4. Individual reflections
5. Summary; share reflections and experiences – a group evaluation of the tools

The process was a bit shorter than initially planned, as described in the process plan in Appendix 15.7, mainly due to time limitations.

## 9.3 Results from the testing of PDAs

Feedback from the participants mainly concerned usability and comments on how well the tools supported creativity compared to the existing use of analogue tools, as described in the sections below:

### 9.3.1 Usability

Ergonomically, the PDA was considered to be *“just fine holding in the hand, with good tactile qualities. Liked the affordance of having a touch screen”*, which was mainly used for pen-based input.

The participants liked using the pen for digital handwriting, but they found it difficult to read or interpret other people’s handwriting on the small displays.

Overall, the PDA was perceived as easy to use, even though two of the participants had trouble opening the lid protecting the touch screen: *“Found it a bit difficult to find the mechanisms/system for opening the transparent protection-lid.”*

### 9.3.2 PDAs versus analogue tools

One of the facilitators participating as a test person in the process commented that *“the most immediate usage of the PDA, as I see it, is as a ‘collecting basket’...; an electronic note or sketch book...”*, but there was consensus in the fact that PDAs are probably more suitable for distributed rather than co-present teams.

The facilitator mentioned that she would prefer to use other existing and well-functioning analogue tools, such as pen and paper, rather than the PDA. The reason seems to be that the PDA doesn’t immediately offer or give any new or extra value to the process or the creative work, when compared to the existing tools.

The only affordances mentioned with the use of PDAs versus analogue tools were the fact that it makes postwork easier when things are digitalized in the process. And it might be useful as a tool if there is a need for anonymous contributions.

### 9.3.3 Overall evaluation

Participants seemed to agree on the fact that PDAs seems to be a very useful tool for individual prework and for distributed work, but not in collaborative creativity conducted as creative processes with participants communicating face-to-face. Further testing should however be provided to test the PDAs potential in connection with other tools such as electronic whiteboards, and as a tool in prework or inspirational gathering outside the physical boundaries of the idea laboratory.

## 9.4 Results from the testing of electronic whiteboards

The whiteboards were used for group idea generation in connection with a creative method called “Askeladden”, which focuses on stimulating one’s associative abilities by using inspirational artifacts such as pictures. Feedback from the participants mainly concerned the usability; the affordances and constraints of the tools and comparisons of the whiteboard with analogue tools, as described in the sections below.

### 9.4.1 Affordances and constraints

Two different sized whiteboards were used in the process. One of them was commented as too small, which limited physical movement: *“When working two on the same display, this was a bit too small.”* A major concern with the whiteboards and the configurations used in this process was that they did not enable simultaneous access or multi-user input: *“We did not have optimal or simultaneous access.”* According to one of the facilitators, this turn-taking *“limited the flow in the collaboration, by only allowing one to be active at the time”*, because *“the effect of waiting for your turn”* makes people passive and inactive.

Another constraint was the technical setup: Projectors connected to the whiteboards were not considered optimal because the users would move in front of the projected image, shadowing the display. Everyone suggested or wanted better technical options, such as projectors hanging from the ceiling rather than on the wall, or a direct connection between the PC or server and the whiteboard.

Usability was considered to be high: One of the participants commented that she *“experienced that the user interface of the Smartboard was similar to software I know”*, and that it was therefore easy to understand and start using it. Another participant commented that *“it was a relatively short step from meeting a new medium to establishing an adequate proficiency level, and to getting started on the creative process.”* The tools were considered easy to use, except for a few misunderstandings concerning downloading and storing pictures.

One of the greatest affordances mentioned was the size of the display and its support for visualization: *“Very positive to get the visual picture in such a large format”* because *“pictures in large format act as stimulating, inspiring,...”* *“The large format opens up a digital interaction space which is definitely strengthening and necessary in a real group-based creative process.”*

Another great affordance was the interactivity made possible through the touch screen: *“Moving elements directly with the hands is optimal...”* The whiteboard supports several different interaction modes; using mouse and keyboard for textual input, color pencils and rubber for hand writing and drawing, or just your hands or fingers for painting or drag-and-drop functions on the touch screen. Interaction was considered *“flexible and intuitive.”*

The participants seemed to enjoy using the whiteboards and experienced that they could use the tools to create something together and actually build on other people’s contributions - *“letting others inspire you.”* One of the participants claimed that *“we actually accomplished a feeling of flow!”*

### **9.4.2 Whiteboards versus analogue tools**

The participants considered the whiteboards to be supportive of creative work, and claim that they would consider using them instead of analogue tools due to the following affordances:

- The visual aspect: *“It is a shared digital space where the format/size has a catching and attractive visual aspect.”*
- The support for different interaction modes, including visual and tactile support.
- Affordances given by all digital tools: Supports capture, storing, editing, copying and distribution of results.

One of the constraints mentioned, the turn-taking, is however so crucial for the creative work that the participants would not consider using the tools unless a simultaneous access to the work spaces is provided.

### **9.4.3 Overall evaluation**

The whiteboards shows great potential and a great set of affordances supporting co-present collaborative creativity. But; there is a set of issues that have to be dealt with in order to avoid a set of constraints limiting creativity: The tools must provide simultaneous access to the work space and prevent turn-taking, and the technical setup must be improved in order to avoid ‘shadowing’ of the display and support physical movement of participants. There are electronic whiteboards available which supports multi-user input and have other technical configurations. Further testing should therefore be conducted to test electronic whiteboards without these critical constraints.

The whiteboard was used for idea generation in this process, but the facilitators see great potential in using the whiteboards in other parts or types of processes and in connection with other creative methods.





## 10 Testing digital pen and paper

The objective of the test-process was to explore usage of the tools – to test usability and functionality. Why? Because Oasen hope that the tools can help them store results of the process digitally, to support distribution of results and post-work.

People involved in the process: One facilitator from Oasen, a researcher from Studio Apertura at NTNU, myself which observed and recorded the process, and the participants: 4 students; three boys and one girl. All of them have participated or facilitated creative workshops before. Technology-wise: 1 expert, 3 average users. In this analysis I will refer to them as participant 1, 2, 3 and 4. Abbreviated to P1, P2, P3 and P4.

This analysis is based on observations, video recordings, digital pictures, process-results, feedback from participants through a survey, reflection notes from the facilitators and an evaluation meeting with one of the facilitators at Oasen.

### 10.1 Why digital pen and paper?

Even though many of the other tools used to support creative work in Oasen might seem to be of a more creative art, such as the odd artifacts and toys, observations shows that paper is a one of the most important tools in Oasen. Paper is used in all processes observed. It is actually represented in almost all of the creative stages throughout the creative process and used for different tasks:

- A4 sized white sheets of paper are used for handing out instructions, for individual idea generation, for individual reflections, and sometimes even for summarizing group results.
- Colored post-it notes are used as name tags and for writing ideas on, which then are used for shuffling around on large posters in order to categorize, relate and select ideas.
- Large white posters are used as the group's shared workspace in the group idea generation stage, and when presenting the ideas in plenary.

Paper seems to be very supportive of co-present collaborative work due to the the following affordances supporting Oasen's needs and requirements:

- Paper supports **mobility**: Paper is small, extremely lightweight and easy to carry with you and move around. It therefore supports **physical movement** of participants and is easily **integrated** in the environment.
- Paper support **multi-user input and simultaneous access**: People can write and draw on the same paper at the same time.
- Paper is **very easy to understand and use**: It has been used as a tool for centuries in all kinds of work and everyday life. People immediately know what do to with it.
- Paper supports **sharing of information**: Paper is used as a tool in order to conceptualize and **visualize** ideas. It is easily handed over to other persons for them to view, or one can hang it on the wall for display.

Unfortunately, there is one great limitation in using paper; it lacks one of the greatest affordances of the digital tools: One can not use paper to capture, store, edit, copy or distribute results in the same efficient way that digital tools can. Oasen wants tools that ensure a greater continuance and larger probability of realization of ideas. In order to do so, one must introduce digital tools that captures and stores ideas and results during the creative process.

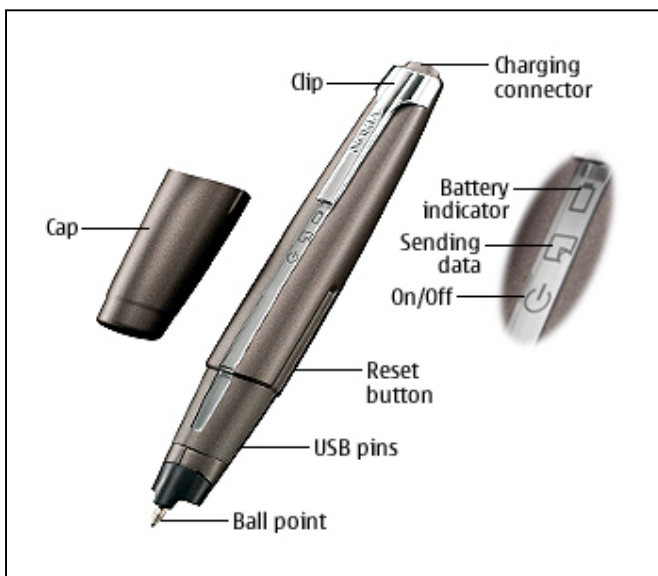
One of the tools that seemed fitted to substitute the use of paper was the PDA. Unfortunately, the results of the testing showed that the participants, including the facilitators, would rather prefer using regular pen and paper. They didn't find the PDAs intuitive and as supportive as regular paper. Research shows that replicating or substituting paper with digital tools have been difficult (Sellen and Harper, 2002; Luff, Heath, Norrie, Signer and Herdman, 2004). Paper have many affordances supporting collaborative work, and it has been very difficult to replicate them all in on technology. However, technologies arising within the new era of ubiquitous and mobile computing is starting to bridge the gap between paper and digital tools (Luff et al., 2004). Luff et al. (2004) mention Antoto technologies as one of the most promising technologies offering a *“way of interlinking paper and digital resources.”*

Digital pen and paper based on Anoto technology was available to us at NTNU, and one of the facilitators tried the tools and found it interesting to test them in a process. We believed that the digital pen and paper would support many of the affordances given by regular pen and paper, and at the same time add the affordances of digital tools, avoiding the limitations given by regular pen and paper – getting the best of both worlds. A test process was therefore planned and conducted as described in this chapter.

## 10.2 Short description of the tools

The digital pen is a device which writes on paper like any conventional pen. But it's also a hardware device that recognizes and tracks the position of where and on what paper it is writing. This is possible when using the special Anoto paper with a fine 0.3 mm spaced dot grid and a coding that enables the pen to identify its absolute position. The pen can send information to other hardware devices like PCs and mobile phones through either Bluetooth or a USB-cable.

Nokia describe the pen as *“A pen that remembers what you write, so you can save and send digital copies of colorful handwritten notes to a compatible phone or PC.”*



Its main features are:

- Works as a normal pen on both digital and non-digital paper
- Records everything you write, sketch or draw on special digital paper
- Memorize up to 100 sheets of A5-sized paper
- Works on chargeable batteries with up to 2 hours writing time
- Transfers information to PCs through Bluetooth or USB-cable
- Stores information on a PC and enables digital editing
- Enables the use of different colors and line thickness when digitalized

Figure 52 Nokia digital pen [13]

The pen works in combination with digital paper. The paper comes in different sizes and in different templates that enables the pen to perform different actions. The papers can have different symbols with different meanings to it: Like an action symbol you can thick with the pen, and the pen's software then understand that you want it to start transferring information to a specified component, like your PC. Or the color template where you thick which color you want the text to be, which will show once it's digitalized on a PC or a mobile phone.



Figure 53 Anoto digital paper, size A5 and B7

For more information about the Nokia digital pen and the Anoto paper and functionality, see [www.anoto.com](http://www.anoto.com).

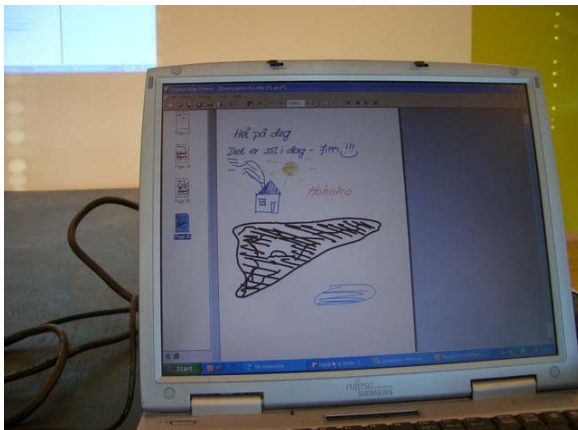
In this analysis I will refer to the pen as a single hardware-device, and use the term 'tools' when referring to the whole package: the pen, the docking-station, the cable, the PC, the software, the paper and the functionality that comes with it.

### 10.3 Short description of the setting



The participants, or test-persons, were organized in two groups a two persons: P1 and P3, and P2 and P4.

Each group was given a Nokia digital pen and a docking station connected to a PC through an USB-cable. They were also given different Anoto digital paper to write on, size A5 and B7. The PC automatically registered the belonging Anoto software application.



One of the groups also had a projector connected to the PC, so that their screen was projected on to the wall.

The groups were seated on chairs in front of a PC standing on a large working table.

Participants were given the following tasks:

1. Freely test the use of the digital pen, and afterwards write down some ground rules on how to use it.
2. Plan a creative process for Pepsi and their marketing of the new soda Mountain Dew. Use the pen actively in the planning, and to plan a process where Pepsi's participants have to use the pen as well.

For more information about the structure of the testing process see Appendix 15.7.

## 10.4 Results from the testing

A survey was handed out to the participants after the process where they were asked about design and usability, positive and negative aspects considering the pen, how they felt about using it in planning a creative process, and whether they felt more creative or not. For more details about the survey see Appendix 15.6.

The results documented here are mainly based on the survey, but are also supplemented with my apprehension of the situation during my observation, video recordings and pictures.

### 10.4.1 Dialogue, curiosity and energy

After a short introduction to the task, the process and the goals of the day, participants were given a short introduction on how to use the tools. They immediately started the task of trying out the pen. Both groups seemed eager and curious. Each group was given one pen. Only one person could use the pen at a time, while the other person had to watch. Instead of sitting passively watching, the persons without the pen kept commenting and had a dialogue with the person using the pen: "...try that and see what happens." [P1 to P3] All of the participants seemed eager, curious and worked energetically. They were all open towards trying new things, even without a clear benefit of doing so.

### 10.4.2 How to use the pen

The participants tried out the tool to find out more about its functionality, affordances and constraints. They soon established some ground rules or a simple tutorial of how to use the pen:

1. Take off the cap and start writing on special paper.
2. You can change color and line thickness by ticking different options in the cover of the notebooks. These will not show on the paper, but they will appear in the digitalized version on your PC or mobile phone.
3. When you want to transfer the information to your computer; just put the pen in its docking station which is connected with the computer with a USB-cable. There will be a message box on the computer telling you that it's uploading, and then the belonging software will start automatically.
4. Everything you have written or drawn will be shown in chronological order (first page first, last page last) on the computer screen. You can now use the software to edit.
5. If you want, you can go back to writing some more on paper, uploading, and continue editing.

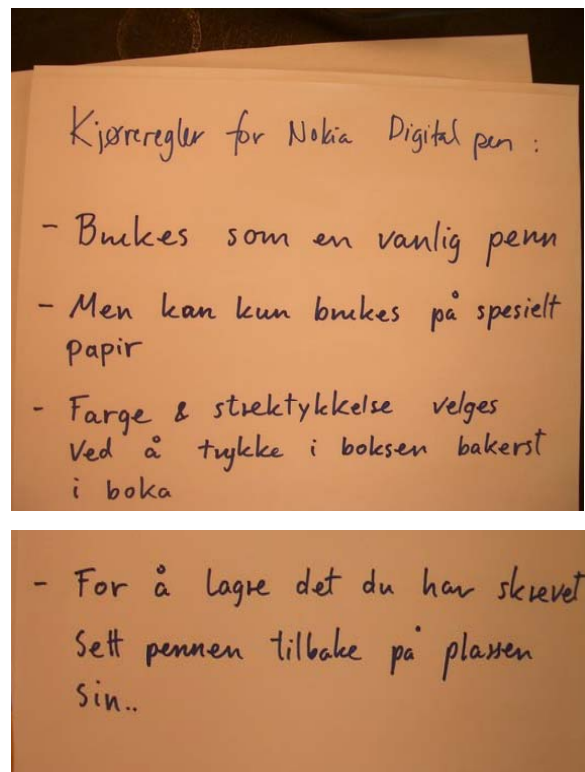


Figure 54 One group's ground rules on how to use the pen

### 10.4.3 Design and usability

The participants immediately understood how to use the tools after a very short explanation. Both the participants and facilitators were surprised by how well things worked: *“The tools were very self-explanatory. Learning by doing... You learn quickly about the usage and its limitations.”* [P1] There were no technical problems and very few misunderstandings on how to use the tools. The following quotations are examples how well designed and how easy the participants experienced the tools:

- *“Many have a built-in fear of digital tools, and the fact that this pen is camouflaged as a totally ordinary pen, simplifies the process. It can be used as a regular pen. The only difference is that as you put it back in its place, everything you have written is stored as digital documents, which easily can be edited.”* [P1]
- *“It is simple to start using it...”* *“I think the threshold...is very low.”* [P2]
- *“It was easy to transfer to the computer, and the software opened up automatically, in a clear way. Even people that are ‘greenhorns’ when it comes to computers, can understand.”* *“I did not experience it as difficult.”* *“It was easy to learn and understand.”* [P3]
- *“I liked it very much and would like to try it in a real idea generation for me and my team.”* [P4]

#### 10.4.3.1 The pen

All of the participants found it very easy to understand the concept and the usage of the pen: *“The concept was so simple...”* *“The fact that you use a pen-metaphor makes it very easy to use.”* [P4] There was no need for any new conceptual models because the pen works just like any regular pen would. As one of the groups listed in their ground rules: *“Use it as a normal pen.”*

Considering the physical design of the pen, the participants were a bit more reserved and slightly negative. All of the participant find the pen a bit big and *“a bit lumpy.”* [P4]. *“It’s a little too thick/big, so that your hand soon becomes tired from writing with it.”* [P3] They all find the pen a bit big, but as P2 put it: *“Even if it seems a bit big, it lies well in the hand.”* P1 feels the same way: *“A good pen, with bigger radius and grip than normal pens. ... bigger and better to hold. The weight is ok. A bit tail-heavy.”* All in all, slightly negative about the size, but it doesn’t seem like a big thing. In fact, the size of the pen was the only negative aspect mentioned concerning the design of any of the physical hardware. And even if it’s a bit big and lumpy, it’s still *“very easy to maneuver...”* and *“quite ok for writing”* [P3].

#### 10.4.3.2 Uploading

All the participants found it very easy to upload information from the pen to the computer, through the docking station:

- *“Transferring to the PC is very good and very simple. Just put it in place.”* [P1]
- *“It synchronizes easily with the computer. Just a little slow.”* [P2]
- *“It was easy to get it all down on paper – and then over on the computer.”* [P3]
- *“The transfer was done quickly and automatically by the pen itself...”* [P3]
- *“It felt natural to put it in the docking station.”* [P4]

#### 10.4.3.3 Software and editing

Participants find it very easy to use the software. P2 claims that *“the software has a very simple interface.”* P1 means that this makes it easy to edit and that *“I think it have what you need to simply and effectively get an overview of the material.”* P3 states that it’s easier to switch between writing and drawing than what would be the case for many other hardware and software components. And that it’s more effective when it comes to editing: *“You can easily cut and paste different ideas – copy to a new page, and continue on it there. This is also possible with a regular pen and paper, but here it’s easier to copy and paste, then rewriting all the ideas by hand.”*

Participants tried exporting the results from the Anoto software to other types of software like Microsoft Word and PowerPoint. P2 experience was that *“it works indeed well to transfer the information from the software to for example Word or PowerPoint, but all the information is then stored as an image file which is absolute and impossible to edit without using special software for image processing.”* P2 is a bit unsure of whether this is a problem or a necessary limitation: *“I struggle a bit with whether I want more functionality in the software, or if it’s cut down to a necessary minimum so that it won’t drown in technical finesse.”*

When asked about negative aspects concerning the tools, participants mentioned two elements: Limitations concerning the special paper and poor visualization of chosen color.

#### 10.4.3.4 The paper

Participants were given A5 and B7 sized paper from Esselte with Anoto functionality. Two of the participants didn’t like the fact that the pen *“can only be used on special paper.”* [P1] P1 doesn’t mention why he doesn’t like it, while P2 would rather use a pen and write directly on to a tablet PC. P3 and P4 are also negative towards the special paper, but they’re concerned about the size of the paper, not the fact that they have to use special paper. P3 strongly claims that there’s very *“limited space on each paper”* and P4 *“...wants bigger sheets!”* Considering the concept of paper, what could be easier to understand? There were no comments about how easy or difficult it was to understand the concept and usage of paper. I just assume that it was equally as easy as understanding the concept of the pen. Video-recordings show that there were few misunderstandings on how use the pen and the paper to write and draw on. The participants did however have some difficulties in understanding the connection and relationship between the entities. It was not clear what was the connection between individual sheets of paper, notebooks, and several pens: *“You could have mentioned that each sheet of paper is unique, and that all the sheets in a notebook are stored in the same document on the computer.”* [P2] But during the testing of the tools they soon found out how things were related: *“We thought that by using two pens you could write on the same document and upload it with information written by both pens. That didn’t work.”* [P4] *“Information follows the pen, not the paper – so if you use several papers it becomes a bigger job to cut-and-paste it together afterwards.”* [P3]

#### 10.4.3.5 The use of color

The other negative aspect that often mentioned were the poor visualization of chosen color: *“You don’t see which colors you have.”* [P3] The colors you choose are only visible once the information is uploaded on the computer. When using the pen to write on paper, all you see is the blue ink. There is no way of telling which color you are using at the time. That you have to remember or you have to upload *“to a computer in order to see what you have really*

'captured'" [P2]. Most of the participants see this as a limitation because colors are just as important when writing on paper, as for editing the digital information: "...colors only stored in the pen can be a limitation when you really need it on the paper." [P2]

P2 definitely see this as a great limitation, whereas P3 states that "it is a minor problem." P1 doesn't comment on the usage of color in the survey, but claimed during the process that there's room for improvement concerning the use of color. P4 agrees but also claims that "It was easy to change color, much easier than changing color pencils."

When looking at the digital results from each group, you can see that they have made use of the color template. Both when drawing, but also for grouping and emphasizing text. So even if the color choices are poorly visualized on paper, it doesn't seem to keep the participants from using colors.

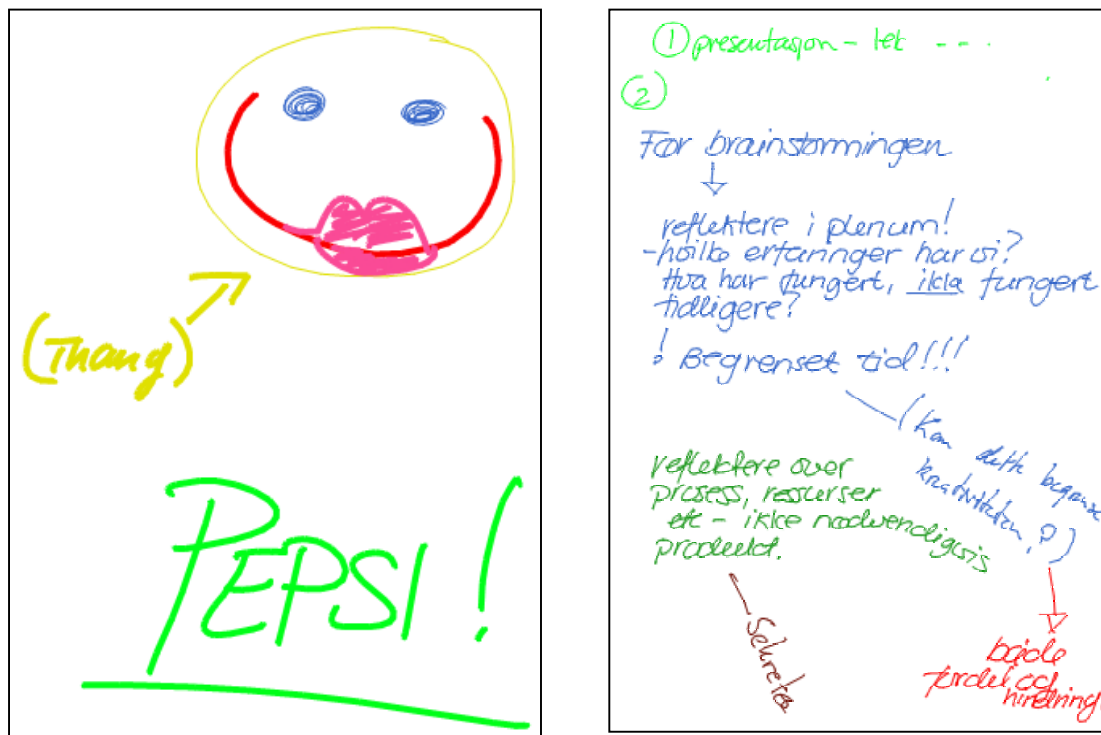


Figure 55 Color writing and drawing with digital pen

#### 10.4.4 Supporting creativity?

The participants clearly see the advantages of the functionality and affordances given by the pen and the tools: "This is a traditional pen, but with an exiting extension. It gets a completely new dimension as a digital unit." [P2] The clearest advantage of using these tools seem to be the fact that "everything you write is stored...digitally in documents on a computer." [P2] Digital documents then give you a lot of new possibilities that other artifacts, like paper, doesn't have: "You maintain your note pages... These can be moved, edited the way you want. It can easily be transferred to other software for editing or presentation." [P2]

Another affordance mentioned is that the tools makes editing and tracing of information easier and more effective than using normal pen and paper: "...it takes a lot less time and effort..."



*“Easy-to-follow, to go back and look at what had been written, instead of rummaging all the papers.” [P3] One of the reasons why it becomes easier and more effective might be that the tools makes the information much “tidier and well arranged.” “When you have it all down on ‘the paper’ that is stored on the computer, then it’s easier to find one’s way in everything – on ordinary paper or post-its you can easily miss or overlook some of the ideas. Here all the proposals, all the points become equally evident.” [P3]*

Participants were asked if they meant that the tools were supportive or at hindrance in the planning of a creative process. P3 answered that: *“My impression is that the pen is good for this use.”* P1 agrees and refers to the fact that *“it felt quite natural to use the pen as an ordinary pen...”* and that it makes it easier to go back and edit the plan: *“You can edit the plan while planning or when finished. Spontaneous ideas are caught and stored, pasted in where they belong.”* P1 also mentions that it becomes easier to *“improve the results some, with just minimal post work.”* P2 also finds the pen suitable for this purpose; *“storing the ideas that comes to mind.”* But P2 points out that you don’t see the “extension” or the benefits of using the tools *“until you transfer the written material to the computer.”* The benefits lie in *“the data acquisition that happens, not in the notes, but digitally in the document on the computer.”* P4 acknowledge the fact that the most valuable effect of the tools lies in its storing and editing capabilities, but also finds that the pen *“supported ordinary writing”* and therefore *“helped support the creative process.”*

#### **10.4.5 Supporting or enhancing creativity?**

Participant 1 did not feel *“more creative by using the pen itself, but solutions you didn’t see on paper can occur in the editing afterwards.”*

Participant 2 claims that the pen didn’t affect the creativity, but that *“the pen memorizes a great deal of the ongoing process. This can be used in a new or different way.”* *“Lot of ideas of concepts created during a creative process can be very transitory. The object is to memorize and store some of this. By revising this information later, or in a new setting, will perhaps generate new or better ideas.”* But P2 points out that people are the ones that captures ideas, and that *“the pen stores information, we choose ourselves how we want to make use of it.”*

Participant 3 didn’t seem to think that they became more creative by using the pen: *“Not necessary more creative, no. I wouldn’t say so. But it didn’t seem to reduce the creativity much either. It was more or less the same as using pen and paper – the only difference is...”* all the affordances the pen have as a tool. It’s mainly easier and more effective to edit information and ideas, and *“...all the proposals, all points, become more evident.”* But P3 also mentions that *“...we found it fun! And in this ‘fun-stage’ it might be that we became more creative, because we enjoyed trying out things with the tools.”*

Participant 4 thinks that *“it supported creativity in the longer term. The fact that ideas are stored makes it possible to generate new ideas when later viewing the original ones.”*

All in all, they see the tools as supportive in planning a creative process, but they’re not certain of whether the tools enhance the creativity in any way. And if so; how. They all claim that they didn’t feel more creative by using the tools, but they think the tools can help to view information in a new way and by doing so, help generate new ideas.

### 10.4.6 Other comments

Participants were asked if they could see themselves using the digital pen in different settings:

- *“I think it’s ideal for lecture notes, as a notebook for everyday life or at work.”* [P1]
- *“For studying, for lecture notes. Stored information can be entwined in documents, other notes, hand-outs, etc.”* [P2]
- *“It’s ideal for mind mapping and brainstorming.”* [P3]
- *“It fits well for individual work as well. For example putting sketches into a document.”* [P4]

P1 comments that *“all ideas are stored even if they’re scribbled down in the middle of a process.”* But P1 also mentions that you need to do some post work in order to store the ideas: It might be difficult to remember the meaning of keywords or intentions unless you organize and tag the information properly. For example writing down intentions or headlines by using textboxes.

### 10.4.7 Results summarized

P1 means that the pen is *“a good thing to use since the barriers are small compared to the gains”* and recommends the use of the digital pen in creative processes in Oasen. P3 *“thinks that the Nokia-pen can be a wise thing to have in Oasen”*, but states that *“there should be more pens available.”* P4 also likes the pen and recommends using the Nokia pen in combination with *“Netmeeting or a similar tool that makes several groups’ ideas available for each other.”*

Participants are mainly positive to the design, functionality and usability of the tools. They all agree upon the fact that the tools can be used for supporting the creative work in Oasen. They’re all more uncertain and doubtful as to whether or not the tools enhance creativity

The affordances - the main positive aspects of using the tools according to the participants:

- Well designed and high usability. It’s easy to understand the concept and you quickly learn how to use the tools: both pen, paper, docking station and PC.
- Uploading was very easy.
- Easy and effective editing of information. Gives a good overview of the material.
- Participants were fond of its functionality and find it suitable for creative processes.
- Supports creativity and might help to generate new ideas.

The constraints – the main negative aspects of using the tools according to the participants:

- The pen is a bit big and lumpy.
- A5 sized paper is too small. And some don’t like using special paper.
- Poor visualization of chosen color.
- A bit difficult to understand the relation and connection between the tools when not explained in advance.

## 10.5 Facilitator's feedback

The facilitator's overall impression of the tools is that it was *“very easy to use, very easy to transfer to PC, and very easy to edit what had been written and illustrated with the pen. No need for many instructions to get the user to understand how the pen can be used and the possibilities in the editing software are many.”* He was overall very impressed with the tools, and how well they seemed to work; both technically and in the creative setting. He did however have a few boggles and concerns about the fact that *“...when you export what you have produced to PowerPoint, Word or e-mail, it is stored as an image so that it can't be further edited in the respective software.”*

The facilitator also registered a few challenges that have to be charged in order to use the pen in real creative processes:

- *“Is it possible to store the sequence... so that it can be shared with others that weren't there, or as a reminder to those that were of how they came up with the end results?”*
- *“Given the fact that each person has a pen and a notebook at their disposal, how should each individual contribution be stitched together as a whole?”*

## 10.6 Discussion of results

This chapter is a short summary and discussion of the results in the previous sections.

### 10.6.1 Usability

The tools was intuitive and “*very easy to use, very easy to transfer to PC, and very easy to edit what had been written or drawn with the pen*” [Facilitator]. Why? Because people are used to writing with pen on paper. There was no need for any new conceptual models. The only thing questioned was the limitations once uploaded on the PC: What can we do, and what’s not possible?

The pen itself have a very simple interface: It’s a pen, a bit bigger than normal pens, but fits in your hand the same way. Putting the pen in the docking-station is easy: There’s a small hole where the pen is supposed to be put, and it’s physically impossible to put it the wrong way.

Editing worked easily; the only question is how well it supports Oasen’s requirement and need for platform independency. The file can be exported as an image to other software programs like Word and PowerPoint, but then it’s no longer editable as in the belonging software. This might be one of the constraints with the tools that one either have to improve by changing the software, or by planning the process in order to avoid any negative effect because of this.

### 10.6.2 Supporting or enhancing creativity?

The tools definitely *support* creativity. The digital pen and paper supports most of Oasen’s requirements and their understanding of creativity:

- The pen is a small, mobile and an **easily integrated** artifact in the room. It does not draw unnecessary attention. People can look at it with curiosity like any of the other artifacts. And it’s easily hidden if you don’t want people to view it.
- The pen fulfills one of Oasen wishes towards ICT: The possibility to **store ideas** and work done in creative processes digitally. So that it can be used for further work, and no ideas will be “lost”. It digitalizes and can be used as a substitute for normal pen and paper. The really great thing is: You have all your original notes both on paper and digital.
- Uploading analog text to the computer and making it digital **supports visualization**: It becomes easier to show what you have written or drawn on a large screen: It takes less time and effort to transform your personal notes, or your group’s idea generation towards a presentation.
- It is supporting the stage of the creative process where ideas are selected and concretized. Once uploaded, the editing-possibilities make it a great tool helping the group to **view all their ideas, rearrange, and select** the ones they like the best.
- All notes and papers are in **handwriting**. This helps establishing **identities** and ownership to each note, drawing or idea. And it supports awareness: Knowing who has written what.

- Using the pen forces everyone to share their ideas. But probably without feeling forced into anything. It's an easier and more effective way of **sharing** ideas: The barriers of ownership to your ideas through "your" physical paper are lowered: It is more difficult handing over your personal notes on paper than uploading them on the computer and then sharing them. It supports a **democratic communication** in the group: Everyone's ideas are shared/everyone is 'heard'. And by visualizing them all either on a PC or projector, it's easier to get an overview of all ideas. The presentation and selection of ideas are no longer that dependent on each participant's ability to communicate their ideas verbally to others. Normally, according to the facilitator, 2 persons in a group of 5 generate about 80% of the communication in the group. Just because their more eager, more aggressive, more extrovert or better at communicating.
- The interaction-level and creativity in both groups were highly positive. **Energy-level** was high, they were **curious** and positive towards testing the pen, and discussion-level was high.

Supporting or enhancing creativity? The participant's answer to this question is in my opinion a bit contradictory: They claim that they didn't feel or become more creative by using the pen, while at the same time believing in the fact that it can generate new ideas by storing and visualizing the original ideas. In my opinion, the tools supports creativity, and used properly, they might also enhance creativity, but more testing is required in order to verify these results.

### 10.6.3 Constraints and challenges

It didn't seem as if the digital pen and paper had any negative impact on the interaction or the creativity in the groups. But some constraints were identified, such as little physical movement because of the setting: The groups alternated between writing with the pen on paper and editing the results on the PC – meaning sitting still on chairs in front of a PC on a table. This setting is a good alternative for trying out and learning more about the tool, but as the groups themselves suggested: When using it in the rest of the creative process, the pen should be used separately, and then uploading and editing should take place after finishing all analogue writing. The creative process needs to be designed so that the pen's affordances come to its right – the pen itself is very mobile, but the PC is not.

Most of the negative feedback concerned constraints in the design of hardware and software. As commented by the participants; these constraints were not critical for the creative work, but would enhance the usability if improved. The impact of the constraints could also be reduced by proper introduction in how to use the tools, including their limitations.

One constraint or challenge identified by the facilitator is tracing the sequence of results and searching through the final material. There is a need for tagging of documents or notes in order to find out which group made which results, which material is the answer to which task, etc. This could potentially be done by creating special paper templates specifically to fit Oasen's needs, but it might be expensive to do so. A cheaper solution is instructing the participants to mark their work by using headlines, group number and such. This is already used for analogue tools.

#### **10.6.4 Summary**

The results from the testing were far better than anticipated. The digital pen and paper worked as planned. There were no technical problems and the tools seemed easy to use.

The tools supports many of Oasen's requirements, as identified in section 8.2, and many of the mechanisms in collaborative creativity, as described in section 6.1 and in the framework in chapter 7. The tools could potentially be used throughout the entire creative process; for initial tasks when setting the stage, for idea generation, concretization and presenting of results, and for individual reflections.

The digital pen and paper is easily accessed; it's a technology available on the market – you can go to the shop and buy it. There's no critical need for developing any new hardware or software, even though there is a set of constraints and drawbacks that could be changed to improve the tools even more.

Conclusion is: The digital pen and paper are very user friendly tools which supports many of Oasens needs and requirements. There are a few constraints concerning the design of hardware and software, but nothing critical affecting the creative work.

# **11 Guideline for designing and introducing tools supporting co-present collaborative creativity**

This chapter presents a guideline for designing and introducing tools that supports co-present collaborative creativity. The guideline starts by describing a list of requirements and implications in section 11.1. Section 11.2 gives a description of which tasks in the creative work might be supported by ICT-tools, and section 11.3 describes a set of scenarios on how to introduce and deploy the tools to support the different stages and tasks described in section 11.2.

## **11.1 Requirements and implications for design and introduction of computer based tools in co-present collaborative creativity**

The requirements and implications presented in this section are general conclusions based on:

- Observations and analysis of collaborative creativity in Oasen, as described in chapter 6.
- The framework presented in chapter 7.
- Requirements and implications based on feedback from facilitators at Oasen, as described in chapter 8.
- Testing of ICT tools in creative work at Oasen, as described in chapter 9 and 10.
- A comparison of results with related work by Streit et al. (1999), Prante et al. (2002) and Schneiderman (2002), as presented in chapter 3.

An overview of which data and results the generalizations have been based on, which related work they are compared to, and what kind of results they are considered to be will be presented at the end of each section.

Results show that in order to support co-present collaborative creativity one must support different tasks, work modes and creative stages and the relations between them, as presented in the framework in chapter 7. This can be done by providing tools supporting the requirements and implications described in the following sections:

### **11.1.1 Provide tools supporting individual idea generation**

Individual idea generation is an important part of collaborative creativity, as described in the framework in chapter 7 and in Oasen's understanding of creativity in section 4.2. Supporting co-present collaborative creativity therefore involves providing tools for individual idea generation and conceptualization of ideas and transferring of the results to other tasks and stages in the process, as described in the next section.

Streitz et al. (1999) defined a need for tools supporting a wide range of creativity techniques. This requirement have been verified through observations of creative processes in Oasen, especially concerning tools supporting individual idea generation: Tools supporting individual idea generation must be closely linked to creative methods and techniques stimulating associations, playfulness, curiosity and other mechanisms supporting creativity and the notion of flow.

<i>Point</i>	Provide tools supporting individual idea generation	Tools supporting idea generation must be closely linked to creative methods
<i>Initial identification of the point</i>	Analysis of formal documentation and interviews, in section 6.2 and case description in chapter 4	Analysis of formal documentation and interviews, in section 6.1
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Three out of four processes observed in section 6.3 shows that individual idea generation is used to create valuable input to the collaborative work (not the SINTEF-process)	Verified by looking at the process plan for the testings.
<i>Generalization is based on comparison of results with</i>		Streitz et al. (1999)
<i>Type of result</i>	Implication for the design of tools; must provide both individual and group support	Requirement connected to both the design and the introduction of the tools

Table 12 Overview of the results that lead to the generalizations in section 11.1.1.

### 11.1.2 Support transfer of information between tasks and stages

One of the overall affordances by introducing digital tools in collaborative creativity is their capability of capturing, storing, editing, copying and transferring information. Digital tools could be introduced only in parts of the creative work, for instance only in the individual or group idea generation. But: The effect of introducing digital tools increases with an overall perspective: It is easier to support digital distribution of results if they have already been digitally captured and stored during the process. It is easier to work digitally in stage 5, 6 and 7; doing group work if things are digitalized in stage 2, 3 and 4; individual work.

Transfer of information between the tasks and the stages in the process, it is therefore simpler if the entire process is digitalized, or else the process must be created in order to avoid constraints due to transitions between analogue and digital tools.

A crucial requirement in order to enable transfer of information between different tasks and maybe even different tools is platform independency, as described in section 11.1.13.

<i>Point</i>	Support transfer of information between tasks and stages
<i>Initial identification of the point</i>	Analysis of formal documentation and interviews, in section 6.1 and 6.2
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Verified by observations in the SINTEF- and the ISFIT-process; clearly showed that results were transferred to the next stages in the process, in section 6.3
<i>Type of result</i>	Implication for design and use

Table 13 Overview of the results that lead to the generalization in section 11.1.2.



### 11.1.3 Provide a shared workspace for group collaboration

Streitz et al. (1999) and Prante et al. (2002) have in the development of i-Land and Roomware emphasized the need for shared displays in collaborative creativity. This need have been verified through observations and testings in Oasen. Analogue tools used for group idea generation and collaborative work in Oasen enable conceptualization, concretizing, categorizing and summarizing by emphasizing and supporting visualization through a physically large shared work space where people can interact, share and collaborate. Results from testing of electronic whiteboards, as described in chapter 9, indicates that replacing these analogue tools can enhance the quality and the efficiency of the creative work by adding new interactive and digital features.

Stewart et al. (1999) claims that shared displays makes it easier to share information and to collaborate because one is less afraid of intruding other's personal spaces. Observations and testing in Oasen also indicates that this might be the case.

The testing of electronic whiteboards also shows that size matters: The work space and displays should be large enough to enable everyone to interact with it simultaneously, preventing turn-taking and promoting multi-user access as described in section 11.1.5. A large display also makes it easier for people to move around physically: Enabling physical movement of participants, which is good for creative flow and collaboration.

<i>Point</i>	Provide a shared workspace for group collaboration	Displays must be large enough
<i>Initial identification of the point</i>	Observation in the SINTEF-process in section 6.3.2.	The testing of electronic whiteboards in section 9.4
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Verified through observations in the ISFIT-process, and feedback from participants in the testing of electronic whiteboards.	Verified when compared to the use of existing analogue tools enabling visualization, in observations in section 6.3
<i>Generalization is based on comparison of results with</i>	Streitz et al. (1999), Prante et al. (2002), Stewart et al. (1999)	
<i>Type of result</i>	Requirement for the design of tools	Requirement for the design of tools

Table 14 Overview of the results that lead to the generalization in section 11.1.3.

### 11.1.4 Provide structuring and editing in the shared workspace

Studies performed by Prante et al. (2002) indicated that “*collective structuring of the shared idea spaces fosters the group's creative productivity.*” Structuring the ideas seems to have a positive effect on the incubational stage of idea finding.

Results in this thesis verifies the findings of Prante et al. (2002) and further indicates that group idea generation involves three important tasks performed in the shared workspace defining a need for structuring and editing:

1. Conceptualization of ideas can be supported by visual and textual communication and editing: Making it easier to understand and communicate ideas to others.

2. Categorizing the ideas; shuffling around, relating them in different ways to see relations in order to discover new connections stimulates idea generation and idea finding; what Schneiderman (2002) defines as ‘relate-create’ and what Wallas described as ‘illumination’; the moment when all ideas finally emerges.
3. A selection of alternatives have to be done to create results, and involves evaluating and selecting the best ideas . This task defines a need for structuring and editing in order to concretize, refine and view alternatives against each other.

<i>Point</i>	Provide structuring and editing in the shared workspace
<i>Initial identification of the point</i>	Observation in the ISFIT-process in section 6.3.4
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Verified by observations and feedback from participants in the testing of electronic whiteboards and the digital pen, section 9.4 and section 10.4.
<i>Generalization is based on comparison of results with</i>	Prante et al. (2002)
<i>Type of result</i>	Requirement for the design of tools

Table 15 Overview of the results that lead to the generalization in section 11.1.4.

### 11.1.5 Prevent versus support turn-taking

Prior to the development of Roomware, Prante et al. (2002), revealed prevention of turn-taking as one of the requirements for “*CSCW tools to support idea finding in co-located groups.*” Turn-taking was defined as a negative constraint in idea generating tasks because it creates a dramatic decrease in performance, blocking the production of ideas.

Results from observations and analyses of collaborative creativity in Oasen verify this requirement: It is quite crucial that everyone can come forward with their ideas in the idea generation stage at the exact moment when the idea occurs, or else it might be forgotten. Everyone knows that it’s smart to write down a good idea when it comes to your mind, and not ten or twenty minutes later, after you have thought of a million of other ideas.

Observations, analyses and testing of tools in Oasen shows that preventing turn-taking is crucial in the idea generation stages, but that turn-taking is actually supported and promoted in other parts of the creative work: Turn-taking is supported and used in order to support a democratic communication and sharing of information, such as in stage 4 where individuals present ideas to the group and in stage 5 during group idea generation. It is believed that the number of ideas and the quality of the results will improve if everyone enabled to share their ideas, or even forced to do so.

Providing simultaneous access and multi-user input in idea generation is a crucial requirements for tools supporting co-present collaborative creativity, but one must also support a democratic communication by supporting turn-taking in tasks and stages involving information sharing and group collaboration.

<i>Point</i>	Prevent turn-taking in idea generation	Enable turn-taking in tasks involving information sharing
<i>Initial identification of the point</i>	The testing of electronic whiteboards in section 9.4	Observation of the method 'talking stick' in the ISFIT-process
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Verified by comments from participants in the testing of digital pen and paper, in section 10.4.	Verified through analyses of other processes; either using other methods such as 'De Bono's hats' or by direct guidance of the facilitator
<i>Generalization is based on comparison of results with</i>	Prante et al. (2002)	
<i>Type of result</i>	Requirement for the design of tools	Requirement for the design of tools

Table 16 Overview of the results that lead to the generalizations in section 11.1.5.

### 11.1.6 Support a multi-communicative approach

Streitz et al. (1999) defined a need for support of visualization in order to inspire and enhance the creative process, as well as other communication channels, e.g. acoustic and tactile. Analyses of collaborative creativity in Oasen verify the importance of using a multiple-communicative approach. It is recognized in the framework in chapter 7 as one of the most important mechanisms used in order to enable and support collaborative creativity.

Supporting a multi-communicative approach will help stimulate the senses, associations, playfulness, and other semi-mechanisms constituting collaborative creativity. It is therefore important to design tools supporting a multi-communicative approach, especially for use in tasks involving idea generation with a need for stimulation and inspiration, and in tasks involving conceptualizing with a need for visualisation and several communication channels in order to explain or view the ideas in different ways.

Visualisation is already mentioned as probably *the* most important communicative approach for supporting creativity. Results in this thesis indicates that visualization is most important for presenting and communicating in a group setting: Presenting individual ideas to the group, or presenting the group's ideas to the plenary. Tactile communication, or tactile input, can be viewed as another important way of communicating or perceiving impulses. Even though it is not emphasized in the same manner as visualization, it seems to be an important way of stimulating people in an individual idea generation stage.

<i>Point</i>	Support a multi-communicative approach, with emphasis on visualization
<i>Initial identification of the point</i>	Analysis of formal documentation and interviews, in section 6.1
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Verified as an important element in all processes observed, in section 6.3, and clarified in chapter 7.
<i>Generalization is based on comparison of results with</i>	Streitz et al. (1999)
<i>Type of result</i>	Requirement for the design of tools

Table 17 Overview of the results that lead to the generalization in section 11.1.6.

### 11.1.7 Flexibility in the process

Prante et al. (2002) defined process patterns and procedures as constraining on creative work. This requirement has not been verified in the results from my observations and analyses. However, strict patterns might influence the creative flow in a negative way, but a general flexible pattern seems important in order to structure the work and support progress. There is a need for a structure in the work defining who does what when, why and which tools to use in order to have progression and reach results. But the pattern must be flexible enough to enable recursiveness of tasks and steps if needed, or to skip steps, to use extra time on some tasks if needed, and so on. It should be up to the participant's needs and goals to define the boundaries, the pattern and the progress of the process. Automated structures or procedures initiated and forced by a system or a programme seems ridiculous, but a flexible structure and procedures initiated by a facilitator or the participants themselves seems useful in order to have progress and create results.

<i>Point</i>	Flexibility in the process
<i>Initial identification of the point</i>	Observations of the EIT- and the ISFIT-process, in section 6.3.
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Verified in the testing of tools; the process plans had to be adjusted to fit the progress and the time frame. In chapter 9, 10 and Appendix.
<i>Generalization is based on comparison of results with</i>	Prante et al. (2002)
<i>Type of result</i>	Implication for the design of tools; how to connect them to each other, and for the deployment; how to deploy it in the process

Table 18 Overview of the results that lead to the generalization in section 11.1.7.

### 11.1.8 Integration and mobility

One of the requirements identified by the facilitators in Oasen was the need for keeping creativity in the center and using ICT as a remedy for supporting creativity. This need was also identified by Streitz et al. (1999) where respondents commented that *"We have the creative potential, not the computers."*

In order to support flexibility in the process, such as switching between different work modes and tasks, and in order to support the layout of the physical setting to match each task, work mode and creative stage, there is a need for flexibility in the design, configuration or placement of the tools. The tools must either be small, lightweight and mobile – enabling people to carry them around or put them away when not needed. Or the tools must be integrated in the setting in such a way that it can be 'disguised' or 'invisible' when not used. That is one of the requirements with largest impact on the physical design of the hardware.

Tools must be mobile, but they must also support the mobility and the physical movement of people. Physical movement is defined in the framework in chapter 7 as an important mechanism in order to support playfulness, energy level and motivation in collaborative

creativity. Tools must be designed so that they enable people to move around carrying the tools with them; enabling people to change their seating or their place in the work setting. Even if the tools themselves aren't mobile, it is important that they still support physical movement. This can be done by providing for instance a large shared workspace as described in the section 11.1.3; enable people to move around the tool and switch working angles.

<i>Point</i>	Keep creativity as the center and ICT as a remedy	Flexible configurations of tools	Tools must be either lightweight and mobile, or 'invisible'
<i>Initial identification of the point</i>	Identified as a requirements in interviews with facilitators, in section 8.2	The use of blackboards in the SINTEF-process, in section 6.3.2.	Results from the 1st meeting - process
<i>Generalization is based on the following observations and results; verifying the initial identification</i>		The testing of electronic whiteboards clearly showed that the technical setup and the design of the hardware can restrain the creative work if it is not flexible enough (see next point also)	Verified through interviews with facilitators, and through testing of tools.
<i>Generalization is based on comparison of results with</i>	Streitz et al. (1999)	Streitz et al. (1999)	
<i>Type of result</i>	Implication for design and introduction of the tools	Implication for the design of tools, especially the hardware	Requirement for the design of tools

Table 19 Overview of the results that lead to the generalizations in section 11.1.8.

### 11.1.9 Identification and version control

As mentioned earlier, one of the greatest advantages of digital tools versus analogue tools is their affordances when it comes to capturing, storing, editing, copying and distributing results. In order to support these tasks, such as the distributing of results, there is a need for marking the results somehow, in order to identify it later. For instance when distributing final results of a process one need to know which group made which summary, and such. Marking of material and results can be done manually by each person or group, but observations shows that some sort of automatic identification is also needed. For instance for keeping track of the sequence of work.

One way to do it is by providing automatic identification of versions, and then provide support for manual identification through for instance special labeled input areas. An automatic storing of versions would also enable an undo- or go-back functionality, and a storing of all versions would make sure that nothing got lost in the process. For instance an idea or a result that didn't seem good at the time, might be evaluated differently later in the process or in the prework.

<i>Point</i>	Enable identification and version control
<i>Initial identification of the point</i>	Feedback from the facilitator in section 10.4
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Verified in evaluation meeting with the facilitator
<i>Type of result</i>	Requirement for the design of tools

Table 20 Overview of the results that lead to the generalization in section 11.1.9.

### 11.1.10 Need for user friendly tools

One of the requirements identified early in this study was the need for user friendly tools. Some issues were discussed when testing ICT tools in Oasen, but overall this have not proven to be such a troublesome issue as first recognized. But; Usability is important. Issues commented on in the testings were possible improvements of hardware and software design. But the one issue which seemed most critical was technical issues like the technical setup of the whiteboards, the fact that the IR-functionality on the PDAs didn't work as well as anticipated, and such.

Facilitators at Oasen state that the creative work must not be disrupted by any technical problems because it might disrupt the fragile feeling of flow, and because it is very time consuming to deal with such issues in the middle of a creative process.

One way to design easy-to-use tools is according to Schneiderman (2002) by providing compatible action patterns and consistent terminology: Software and interfaces should be built on a suitable action pattern. In other words; the conceptual model used should represent the action taking place. For instance action patterns like 'annotate-consult-revise' or 'open-save-close'. The testing of tools verifies this: Tools that were easy to understand was easy to use. The conceptual model and understanding of how to use the tools seemed quite crucial. For instance was the digital pen and paper perceived as very easy to use because everyone immediately understood that this tool could be should pretty much like a regular pen and paper: It had similar procedural steps and pretty much the same affordances and constraints.

<i>Point</i>	Tools must be very simple and user friendly	Provide well-known conceptual models
<i>Initial identification of the point</i>	Identified as a requirements in interviews with facilitators, in section 8.2	Identified in the testing of digital pen and paper, in section 10.4.3
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Verified by feedback from participants in the testings, in chapter 9 and 10	
<i>Generalization is based on comparison of results with</i>		Schneiderman (2002)
<i>Type of result</i>	Requirement for the design of tools	Requirement for the design of tools

Table 21 Overview of the results that lead to the generalizations in section 11.1.10.

### 11.1.11 Use multiple tools

Schneiderman (2002) claims that using multiple creativity support tools will be more effective than using one single tools for all tasks. This statement was quickly verified by the facilitators as a requirement for using ICT in Oasen: They would rather have a set of multiple easy-to-use tools with low functionality than one tool that does it all.

Using several tools and connecting them by providing platform and software independency, will make it easier to design tools that fit each task, work mode and creative methods spesifically. Each task and work mode requires different support, as described in the sections above. It is therefore better to have a range of tools to choose from according to preferences, rather than getting lost in a large complex tool with an overkill of functionality. Using simple tools will also increase the usability, as described as a requirements in section 11.1.10.

<i>Point</i>	Use multiple tools
<i>Initial identification of the point</i>	Identified as a requirements in interviews with facilitators, in section 8.2
<i>Generalization is based on the following observations and results; verifying the initial identification</i>	Observations of creative processes in section 6.3 verifies that there is a large set of simple analogue tools that can be used in different combinations with one another.
<i>Generalization is based on comparison of results with</i>	Schneiderman (2002)
<i>Type of result</i>	Implication for design, introduction and deployment

Table 22 Overview of the results that lead to the generalization in section 11.1.11.

### 11.1.12 Platform and software independency

Schneidermand (2002) claims that it is important to ensure a smooth integration across different tools and a smooth coordination across windows. In order to do so, one must enable file transfer and transitions by providing platform and software independency. This is an important requirement needed to be fulfilled in order to support many of the requirements listed in the previous sections, such as enabling transitions between tasks, work modes and creative stages, and enabling the use of multiple tools.

<i>Point</i>	Support platform and software independency
<i>Initial identification of the point</i>	Identified as a requirements in interviews with facilitators, in section 8.2
<i>Generalization is based on comparison of results with</i>	Schneiderman (2002)
<i>Type of result</i>	Requirement for the design of tools

Table 23 Overview of the results that lead to the generalizations in section 11.1.12.

### **11.1.13 Summary**

Supporting co-present collaborative creativity can be done by fulfilling the following requirements:

1. Support different tasks, work modes, creative stages and the relations between them:
  - a. Provide tools both for individual and group idea generation
  - b. Use multiple tools to support different tasks or input modes
  - c. Support transfer of results between the tasks and different tools by providing platform and software independency
  - d. Prevent turn-taking in idea generation, but support it when sharing information in a group setting
2. Provide structuring and editing of the shared workspace in order to support idea generation and idea finding.
3. Support usability; both concerning interface design, software and hardware design, and technical setups.
4. Provide digital capturing, storing, editing, copying, searching, transferring and distribution of results, and support it by enabling storing of versions, marking and identification.
5. Support flexibility, both concerning the structure of tasks according to the process, and the flexibility of tools according to different tasks, preferences and integration in the environment.
6. Support mobility and physical movement of people and tools.
7. Support a multi-communicative approach, with emphasis on visualization.



## 11.2 Tasks which can be supported by ICT tools

The framework in chapter 7 describes a which tasks and creative stages that are constituting co-present collaborative creativity. Observations of creative processes as described in section 6.3 and testing of tools as described in chapter 9 and 10, have clarified which part of the creative work that can be supported by ICT tool. Tasks that can be supported by ICT, and examples of how it can be done is presented below:

1. *Welcome and arrival*: This stage involves human contact and have no needs for tools of any kind.
2. *Set-the stage*: This stage involves two tasks that could be supported by ICT tools: **Distribution and visualization of instructions and tasks**. ICT tools, such as PDAs, could be used for distributing instructions digitally to each participant, to each group, or both. Depending on the needs. Electronich whiteboards or other types of tools providing large displays could be used for visualizing the instructions in plenary.

Games conducted in order for participants to get comfortable with one another, so-called ice-breaking games. Most of them are very much focusing on physical movement and human contact, but some of them, such as one used in Oasen involving portrait-drawing and interviews, could be supported by ICT tools, but; is it necessary to document this part of the process?

3. *Individual idea generation* could be supported by ICT tools depending on the type of process it is; what the focus and the goal of the process and this stage is, and which creative methods is chosen in order to support it. Some creative methods are very well supported by both analogue and digital tools; such as ‘Askeladden’. Methods focusing on verbal communication and body language, such as role plays or certain types of games, might not be that easy or relevant to support by ICT tools, or any tools at all.

Individual idea generation is supported through creative methods stimulating the senses, appealing to one’s associative abilities, stimulating playfulness and curiousness, and other mechanisms supporting creativity. Some tools could certainly trigger one curiosity and trigger playfulness, but the one mechanism and task with the largest potential of supporting might be people’s associative abilities: **Using ICT tools to stimulate association** by for instance visualizing stimulating input or providing ways of connecting or structuring new relations in order to discover new connections.

Another important task in idea generation is conceptualization. ICT tools could **support conceptualizing by supporting a multi-communicate approach**. For instance by providing a mix of visual and textual input – giving people different communicative ways of expressing their ideas, which would also support the next stage – presenting the ideas to others.

4. *Presenting ideas to the group* involves explaining your ideas to others. Observations show that visualizing your ideas while giving oral explanations provides different angles of viewing and understanding the concept. ICT tools can easily **support visualization**, as observed in the testing of the electronic whiteboard, and in the SINTEF-process. ICT tools might also add new creative features to these presentations through sound, interactive images or video, but further testing is required to verify so.

A democratic communication and sharing of information is believed to enhance creativity or the quality of the results. In order to support a democratic sharing, ICT tools can be used to **force turn-taking or indicating whose turn it is** to present, who has contributed the most or the least, or such.

5. *Group idea generation* involves conceptualizing and concretizing ideas, categorizing and structuring the ideas in order to find new solutions, and then selecting and summarizing the best ideas as results. These tasks seems highly supportive by the use of ICT tools:

Conceptualizing and concretizing can be done in the same way as stage 3; by supporting a multi-communicative approach with emphasis on visualization. Meaning for instance a large display with different communicative aspects such as pictures, sound, colors, etc.

**Categorizing and structuring of ideas can be provided by dividing a large display into multiple windows** visualizing all contributions and providing space and editing possibilities where one can cut-and-paste and generate new solutions. This could also support a comparison of alternatives in order to select the best ideas. One could also provide an evaluation or rating of ideas to support a democratic decision.

6. *Present ideas to the plenary* involves the same tasks and same need for support as stage 4, but visualization and the size of the display might be even more important due to an increased number of people involved.
7. *Evaluation of ideas and results* can be done in many different ways as described in section 7.2.2. : Plenary evaluation of one group's ideas and **evaluations** within the group could be **supported by digital ratings or comments** from each participants. Anonymously if preferred. Plenary discussion or evaluations as part of group discussions are more difficult to support directly, but could be indirectly supported by visualizing how many hits or how well related one idea is to another.
8. *Reflection, summary and further work* can take many forms depending on what the goal of the process is, time limitations, project size and such, but in usually involves an individual reflection including textual description, a plenary summary lead by the facilitator which sometimes also summarizes the main points by writing them down or visualizing them on a blackboard or poster, and securing the results, and maybe plan further work if needed.

The individual reflection is quite private, and could be supported by private ICT tools such as PDAs or digital pens.

The summary could be easily supported by already existing digital tools used elsewhere in the process.

Securing the results is a very simple tasks if the entire process is digitalized. If not, one can digitalize analogue results by taking pictures or scanning documents.

Planning further work can be supported by many different tools, but most relevant is probably using private tools for scheduling meetings and assigning tasks.

Scenarios describing in which tools could be used for supporting which tasks and which parts of the process, is presented in the next section.

## 11.3 Scenarios of usage

This section presents a set of scenarios describing which tools and ‘toolboxes’; combinations of tools, could be used for supporting the tasks described in the previous section.

### 11.3.1 Toolbox A: Electronic whiteboards and digital pen and paper

The toolbox consists of the following tools:

- Digital pens
- Digital paper/notebooks
- Docking stations
- PCs
- Electronic whiteboards

Digital pens are used for writing on digital paper or notebooks. The results are visible on paper, but is also digitally stored in the pen and can be uploaded to a PC or other objects through a docking station or by Bluetooth-technology. The digital material can be transferred to for instance to an electronic whiteboard for digital editing of the material.

Toolbox A can be used to support pretty much the entire process; from stage 2 till stage 8:

An electronic whiteboard could be used by the facilitator to visualize and explain instructions and tasks in stage 2. If there is a need for ice-breaking games or ‘getting-to-know-one-another’ tasks, then the digital pen and paper could be used for instance to support a creative method involving portrait-drawing and interview of a partner.

Stage 3 could be supported by using digital pen and paper for individual note taking and conceptualization. The results could be transferred to a computer or directly to an electronic whiteboard, which could be used for visualizing when presenting the ideas to the group in stage 4. When all group members have presented and uploaded the ideas, the groups could continue using the whiteboard for concretizing and categorizing in stage 5, and for visualizing and presenting the ideas to the plenary in stage 6.

Stage 7 involves some sort of evaluation of ideas, either prior or after stage 6. An electronic whiteboard could be used to support an evaluation within the group by enabling annotation and rating of ideas. Digital pens and paper could be used to support a plenary evaluation of a group’s ideas where each participant make individual comments during the presentation, and all comments are then uploaded after each group’s presentation, and maybe even visualized on the electronic whiteboard and discussed in plenary.

In stage 8 the facilitator could use an electronic whiteboard for making a plenary summary. Digital pens could be used to support individual reflections, which then could be transferred to personal objects like mobile phones, PDAs or PCs.

A model visualizing the use of tools is presented in the figure below:

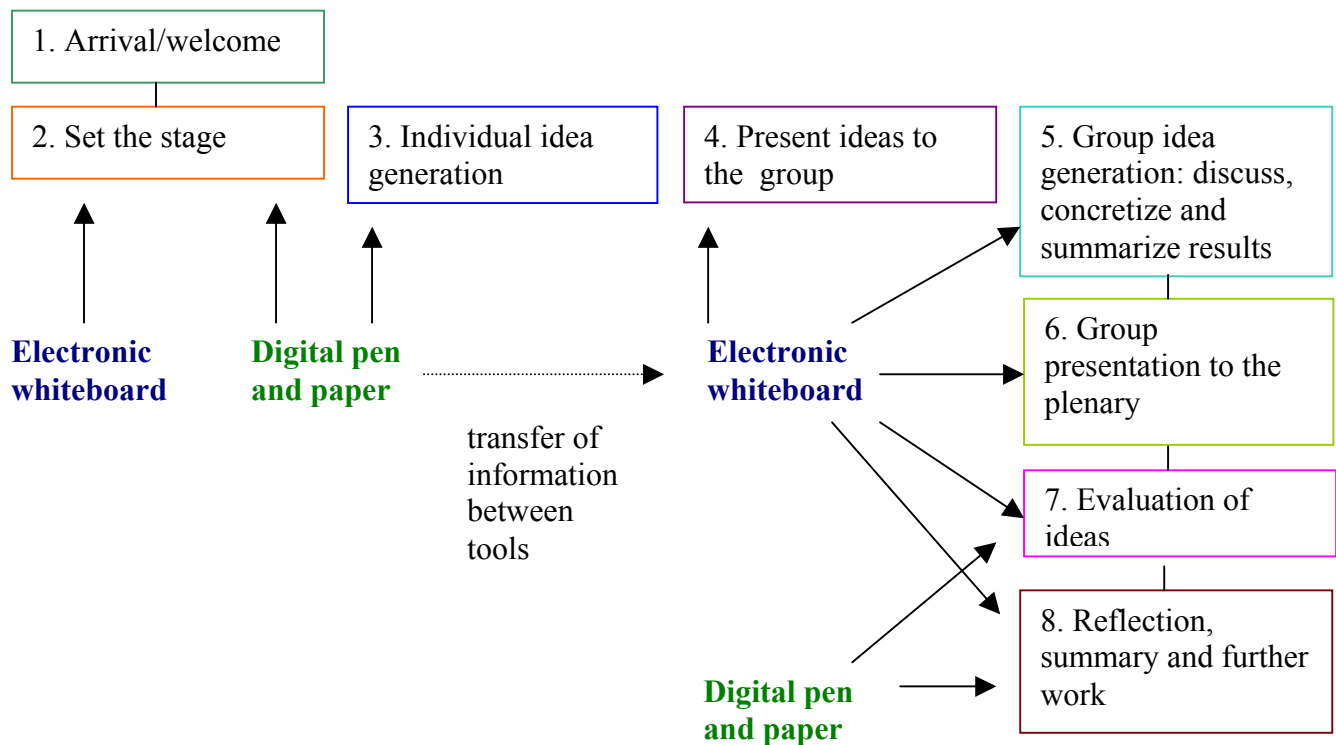


Figure 56 Visualizing how to use Toolbox A in a creative process

### 11.3.2 Toolbox B: PDAs and electronic whiteboards

Toolbox B is very similar to toolbox A; the only difference is the replacement of the digital pen and paper with PDAs. PDAs can be used similarly to the digital pen, but the tools have slightly different functionality and affordances. Which one is the best depends on goals and needs. The PDA might be more useful as a tool in distributed work than in co-present, but why not make part of the process distributed?

Toolbox B can support stage 2-8 in a creative process, as described below:

The electronic whiteboard could be used for visualization in stage 2, and the PDA might be used for supporting ice-breaking games where one took advantage of its IR-functionality for transferring information between the PDAs.

The PDA could be used for inspirational gathering as part of stage 3 where each participant is given a PDA and sent out of the idea laboratory to capture input stimuli and generate ideas for the group idea generation stage. The results could be uploaded to an electronic whiteboard which then could be used throughout stage 5-8, in the same way as in toolbox A. The PDA could also be used for individual reflections and for planning further work in stage 8.

### **11.3.3 Toolbox C: Digital camera and electronic whiteboard**

Toolbox C consists of:

- Digital cameras
- Electronic whiteboards
- Digital pen, PDAs or PCs - optional

Toolbox C is similar to toolbox B; it is a set of tools that supports distributed capturing of stimuli and idea generation outside of the idea laboratory. Electronic whiteboards could support stage 2 and 5-8 in the same manner as described in toolbox A and B. Digital cameras could be used for collecting images outside the idea laboratory as part of stage 2; either as an individual task, in pairs or groups. The results could be uploaded on a PDA, PC or a whiteboard when returning to the idea laboratory. If it is defined as an individual task, then using a digital pen or PDA could support further conceptualization through annotation in stage 2. If it is defined as a task involving two or more people, then it would be natural to use the input from the camera for further idea generation on a PC or a whiteboard in stage 5.



## 12 Evaluation and further work

An evaluation of the results is given in section 12.1 and a discussion of the results versus the research questions is presented in section 12.2. Section 12.3 provides a brief evaluation of the methodical approach, and section 12.4 summarizes the evaluation into suggestions for further work.

### 12.1 Evaluation of the results

This section presents an evaluation of the results described in the framework in chapter 7 and the guideline in chapter 11, including a short summary and evaluation of my contribution to the field of computer support for creative work.

#### 12.1.1 Evaluation of the results presented in the framework

The framework describes three important aspects of co-present collaborative creativity:

1. A general pattern of structure
2. Elements, such as mechanisms and tools constituting co-present collaborative creativity
3. A description of how the elements are implemented in the structure

It is difficult to draw conclusions and generalize results based on one case study, but a comparison of the results with related work of Schneiderman verifies that there is some ‘truth’ in the general pattern that seems to be useful in order to understand the concept and structures in co-present collaborative creativity.

The elements identified in section 7.2.4 are mostly very abstract elements which can be difficult to identify due to their complex relations, as initially described in section 6.1 and 6.2, and also difficult to describe in an objective manner. The results presented in section 7.2.4 might therefore prove to be different in other cases, but the general categorization in section 7.2.4.4 should however be useful in many settings.

The complex relations between the elements also makes it difficult to give a clear description of how they are implemented in the creative process as described in section 7.2.5, but the model presented in figure 51 presents a very general pattern which might be useful in many settings. The relations described in the model shows a flow of information and results, and describes what consequences certain decisions can have for choices made prior to or throughout the process. This part of the implementation and structure is however not fully documented, since my focus has been entirely on the creative process and not pre- or postwork.

Feedback from Oasen concerning the framework is overall positive: *“First of all I must commend you for your thoroughness. You have done a very well job in describing a framework to identify the use of ICT-tools in a creative process.”* They particularly liked the description and the visualization of the general pattern given in figure 46 and *“especially the comparison of this figure with the model of Schneiderman.”*

The objective of the thesis was to provide a framework and a guideline describing how to design and introduce computer based tools in the merge of CSCW, ubicomp and mobile technologies. The study have tested tools developed within this intersecting domain, but the results have proven to be somewhat more general, especially the framework. It is a conceptual framework that might be used for other purposes than just helping one to understand how to design or introduce computer based tools. Even if it is general, it does however describe quite specifically an understanding of co-present collaborative creativity that demands a set of tools supporting collaboration, creative mechanisms and thinking, physical movement and flow.

The framework presented in this thesis conceptualizes co-present collaborative creativity. Something no one seems to have done in prior and related work. The work most related to this framework has been the collect-relate-create-donate framework by Schneiderman (2002), but his focus has been within a system-view of creativity. My contribution is therefore a more descriptive framework for computer based tools in creative work within collaborative view on creativity.

### **12.1.2 Evaluation of the results presented in the guideline**

The requirements and the implications presented in the guideline mainly describe a set of general requirements for the design of tools supporting collaborative creativity. It does not strictly focus on how to introduce the tools; as in how to physically or organizationally manage an introduction of the tools. The guideline provides a description of which tasks and parts of the creative process that the tools might be introduced in and supportive of, but it does not provide a detailed description of how to do it or possible obstacles. Results indicates that the role of the facilitator and the connection to creative methods are important, but these indications have to be further studied to be verified and clarified, as described in section 12.4.

The guideline can be useful for:

- Describing requirements and implications for the design of computer based tools supporting co-present collaborative creativity; especially concerning hardware and interface design and configurations.
- Evaluating and selection appropriate existing tools, and defining which parts or tasks one would like to support by digital tools or not.

The guideline is less useful for describing how to physically or organizationally introduce or deploy the tools. And it does not provide any detailed descriptions of technical needs such as bandwidth, architecture or infrastructural needs.

My contribution to the field of computer based tools for collaborative creativity has mainly been verification and a clarification of requirements for the design. All findings in related work by Streitz et al. (1999), Prante et al. (2002) and Schneiderman (2002) have been verified or clarified. The results also involves a set of requirements not identified or explicitly described in related work, were the following three might be most important:

- The need for tools both supporting individual idea generation as well as group idea generation, and close connection and transfer possibilities between the different work modes.
- Enabling or supporting turn-taking in tasks involving information sharing is important to ensure a democratic communication.
- Tools must be either lightweight and mobile, or large enough and ‘invisible’.



## 12.2 Evaluation of results versus research questions

This chapter presents a discussion of how well the thesis answers the different research questions, as presented in chapter 2.2.

*RQ1: Which elements constitute collaborative creativity? And how are they related?*

*RQ2: How is creative work structured?*

These research questions were the starting point in my study: I started by analyzing documentation and feedback from facilitators to form an initial understanding as described in section 6.1 and 6.2. The results were verified and clarified through observations as described in section 6.3, and general conclusions were drawn based on these findings, as described in the framework in chapter 7.

*RQ3: Which tasks or parts of the creative work might be suitable for technology support?*

Observation of creative processes and conversations with facilitators gave me an idea of which tasks and parts of the work might be supported by ICT tools. Ideas and examples are presented throughout the thesis. The research question is explicitly discussed and answered in section 11.2 in the guideline, and exemplified through scenarios in section 11.3.

*RQ4: How is information shared?*

This research question has not been explicitly discussed in the thesis, but has worked as a reminder that the focus is within the CSCW domain and on collaborative creativity, not just computer support for creative work. Results from observations partly answer the research question by identifying communication patterns. It is also indirectly documented and presented as part of the creative stages in section 7.2.2 and in the description of tasks in section 11.2.

*RQ5: How can technology be introduced and deployed in the creative work?*

This research question is partly answered by describing the scenarios in section 11.3, and by defining a framework providing a conceptual understanding of how collaborative creativity is structured in order to define which tasks can be supported and in which parts one can introduce technology. However, introduction and especially deployment of the technology has not been the focus of this thesis. One must have something to introduce or deploy before studying how one best can do so; meaning that the focus have been on the design of tools, rather than the deployment. Further studies of more social or organizational art might therefore be required.

*RQ6: Which gains does technology support give?*

This research question was presented to the facilitators at Oasen in order to verify and clarify which needs, goals and expectations they had concerning ICT tools. Their answers are as described in section 8.1. The questions is also partly answered through observations of creative processes and in testing stating that the main affordance of digital tools is their ability to capture, store, edit and distribute results, and exemplified in the description of tasks and scenarios in the guideline in chapter 11.

*RQ7: What implications does collaborative creativity have for the choice of technology?  
What are the requirements?*

The objective of the thesis was to establish a set of requirements and implications for design and introduction of computer based tools in collaborative work. Observations and interviews in Oasen have provided a set of requirements and implications which have been generalized

based on a comparison of findings in related work. An explicit and thorough description of requirements and implications is presented in the guideline in chapter 11.

*RQ8: Which tools are suitable for supporting collaborative creativity?*

Related work revealed a set of technologies in the merge of CSCW, ubicomp and mobile technologies which had shown potential in collaborative or creative work. A set of tools were chosen for testing based on the requirements identified in Oasen as described in section 9.1 and 10.1. The results proved to be quite positive and an example of tools that can be supportive of creative work is presented in section 11.2 and 11.3.

All research questions have been considered and answered throughout the thesis. There is however more focus on the research questions most directly connected the results; The focus have been on RQ1 and RQ2 in order to define the framework in chapter 7, and RQ3 and RQ7 in order to define the guideline in chapter 11. The other research questions are used to provide an overall picture and help complement and validate the results, and are therefore more indirectly answered throughout the different parts of the thesis.

*MRQ: How can computer technologies in the merge of CSCW, ubicomp and mobile technologies support co-present collaborative creativity?*

Results answering the research questions described above is presented as a summary in the conclusion as an answer to the main research question (MRQ).

## **12.3 Evaluation of method and research material**

Critique of the work conducted in this study could be that the empirical material is limited; it is difficult to validate results from only one case. Especially since the material and the case is quite abstract and difficult to describe in an objective way. Further studies of other cases for comparison would help to verify and clarify the findings in this thesis.

Observations of creative work in the case have been documented both in similar and various ways in order to capture as many perspectives of the work as possibly, but still make it possible to compare the results in order to generalize them.

Generalizations made in the framework in chapter 7 and in the guideline in chapter 11 are based on the empirical data from the case compared to findings in related work as described in chapter 3. This approach has been chosen to better show my contribution in the field, and in order to validate the results.

## **12.4 Suggestions for further work**

As mentioned in section 12.1 there is a need for further studies in order to define how to deploy or physically introduce ICT tools in creative settings. Deployment is commonly known to be a problematic issue concerning organizational structures and unwillingness to use new tools (Gasser, 1986). Further studies of more social and organizational art are therefore required.

As mentioned in section 12.2 it is difficult to validate the results based on one case, and further studied should therefore be conducted in order to compare the results based on a larger and maybe more differentiated empirical material.

Further work is also needed in developing or finding ICT tools that fits the requirements and implications described in this thesis. Tools should be tested in connection to different creative methods to clarify which methods they might support or not. This involves a further study of which mechanisms and semi-mechanisms is enabling and supporting creative thinking. There is also a need for developing new creative methods adjusted to the affordances enabled by digital tools.

It would be interesting to test tools in everyday settings without the strong guidance and facilitation supported in training or idea laboratories such as Oasen. It would be interesting to study other types of co-present collaborative work in order to verify and clarify the structures, patterns and requirements identified in this thesis.

Describing how to support creativity in other settings is also interesting. For instance how to support creativity in co-located teams; not necessarily present face-to-face or in the same room, but in the same building or corridor, or in geographically distributed teams.



## 13 Conclusion

How can computer technologies in the merge of CSCW, ubiquitous and mobile technologies support co-present collaborative creativity? This study has observed collaborative creativity in practice and general conclusions are drawn when compared to related work. The results show that in order to design computer based tools to support co-present collaborative creativity one must:

1. **Support a flexible configuration of individual, group and plenary work** as described in the general pattern in the framework section 7.2.1 and in the guideline section 11.1.7.
2. **Support a set of mechanisms and semi-mechanisms enabling and supporting collaborative creativity** as described in the framework, section 7.2.4, and an implementation as described in section 7.2.5. Special emphasis should be put on **supporting a multi-communicative approach**, as described in the guideline section 11.1.6.
3. **Provide different tools supporting both individual and group idea generation**, including the relations and transfer between different work modes, tasks and tools, as described in the guideline section 11.1.
4. **Provide structuring and editing in the shared workspace**, as described in the guideline, section 11.1.4.
5. **Prevent turn-taking in idea generating tasks, and enable or support turn-taking in tasks involving information sharing**, as described in the guideline section 11.1.5.
6. **Design tools that are either lightweight and mobile, or large, but ‘invisible’**, as described in the guideline section 11.1.8.
7. **Provide a set of multiple user friendly tools connected to each other**, as described in the guideline section 11.1.10 and 11.1.11.
8. **Provide platform and software independency** in order to enable the requirements listed in point 1, 3 and 7, as described in the guideline section 11.1.12.
9. Support storing, retrieval and distribution of digital material by **providing identification and version control**, as described in the guideline section 11.1.9.

Observations and results also show that ICT tools can be used for supporting all creative stages in a process and tasks were there is a need for capturing, storing, editing, presenting or sharing of ideas and results. The potential gains of introducing ICT tools are therefore many.

The objective of the thesis was to describe a framework conceptualizing co-present collaborative creativity and to define a guideline on how to design and introduce computer based tools in creative work. I hope the results of the thesis can provide a set of general results contributing to the field of computer support in creative work, and that this thesis will motivate and help my case to continue their search for tools supporting their creative work



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# 15 Appendix

## 15.1 Interview guide - for interviews with facilitators

### Bakgrunnsinformasjon

1. Kan du si litt om deg selv? Hvem du er?  
(**Personalia**: navn, alder, utdanning, yrke/stilling)
2. Gi en beskrivelse av **Oasen**
  - a. Hvordan definerer du det arbeidet som foregår i Oasen?
  - b. Hvem er brukerne av Oasen?
  - c. Hvorfor ble Oasen opprettet?
3. Hva er din tilknytning til Oasen? Hva er din **rolle**?
4. Si litt om hva du legger i følgende **begreper**:  
(Definisjon av begrepet og ditt forhold til teknologien: bruk, erfaring og kompetanse)
  - a. IKT
  - b. Samhandlingsteknologi
5. Hvordan fungerer **kommunikasjon i Oasen**? (kommunikasjonsveier, verktøy, deltakere)
  - a. Internt
    - i. Mellom de ansatte
    - ii. Mellom ansatte og brukere
  - b. Eksternt
    - i. Mellom ansatte og eksterne personer
    - ii. Mellom brukere og eksterne personer

### Om kreativitet

6. Definer hva du legger i begrepene **kreativitet og kreative prosesser**?
7. Hvilke **betingelser** må være tilstede for at noe skal kunne kalles kreativt?
8. Hvilke betingelser må være tilstede for å kunne ha en kreativ prosess?
9. Er **ansikt-til-ansikt** kommunikasjon en betingelse? Fysisk tilstedeværelse?
10. Kan du tenke deg, eller kjenner du til eksempler på kreative prosesser som foregår uten ansikt-til-ansikt kommunikasjon?
11. Hvilke teorier/**filosofier** arbeider du/dere ut ifra i Oasen?  
(I motsetning til?)
12. Hvilke **faser** inngår i en kreativ prosess?
13. Har man noe spesielt **fokus** i slike prosesser? Evt hva?  
(Deltakerne, mål, problemstilling, verktøy, opplevelser, ?)
14. Evt, varierer fokus i forhold til hver enkelt fase? Eller i forholdt til hver enkelt prosess?
15. Hvilke betingelser må være tilstede i Oasen for at den kreative prosessen skal være vellykket?
16. Hvilke **produkter/resultater** skapes gjennom kreative prosesser i Oasen?  
(Beslutninger, rapporter, bilder, video, tegninger, ?)

### Eksisterende teknologi og bruk

17. Hvilke teknologier og verktøy (IKT) brukes i Oasen pr i dag?
18. Vet du om noen **eksisterende samhandlingsverktøy** du tror ville være hensiktsmessig å ta i bruk i Oasen?
19. Evt, hvorfor er de ikke tatt i bruk allerede?
20. Hvorfor er "IKT og kreativitet" et **aktuelt tema** i Oasen nå?
21. Har temaet vert tatt opp tidligere?

22. Evt, hvorfor ikke? Eller hva var konklusjonen?
23. Er det skjedd noe som gjør det aktuelt å ta opp temaet nå?
24. Ser du noen **nytteverdi** i bruk av samhandlingsteknologi i Oasen?
25. Har du noen tanker om hvor godt **utviklet og utbredt** aktuell teknologi er?  
(Verktøy: funksjonalitet, brukervennlig, billig/prisgunstig, utbredt/vanlig.  
Teknologi: ”det bakenforliggende”, infrastruktur, f. eks nettverk)

### Ønsker og krav til IKT i Oasen

26. Hvordan tror du at slik teknologi kan bidra til å støtte arbeidet i Oasen?  
(Spesielle ønsker eller behov?)
27. Hvilke **kriterier** ville du sette til et slikt verktøy?
  - a. I forhold til kreative prosesser
  - b. I forhold til samhandlingsteknologi ( hva som finnes)
  - c. I forhold til Oasen som kontekst
  - d. I forhold til brukerne
  - e. I forhold til kommunikasjon
28. Hvilke **forventninger** har du?
29. Hva ville vert **den ideelle situasjonen** (IKT i Oasen)? Se for deg en fremtidsvisjon hvor alt er mulig.
30. Hva tror du er mulig nå (evt i nær fremtid)?
31. **I hvilke deler** av den kreative prosessen ville det være nyttig å ta i bruk IKT og samhandlingsteknologi, og ikke?
32. Hvorfor eller hvorfor ikke?

### Utfordringer

33. Ser du noen **problemer** med bruk av samhandlingsteknologi? (generelt)
34. Hvilke problemer tror du man vil støte på i innføringen av samhandlingsteknologi i Oasen?
35. Tror du det er mulig å **integre** samhandlingsteknologi i kreative prosesser, uten at teknologien blir **dominerende**?

### Annet

36. Hva legger du i begrepet ”mobil IT”?
37. Hva legger du i begrepet ”ubiquitous computing”/allestedsnærværende IT?
38. Hva legger du i uttrykket ”integrering av teknologi”?
39. **Nevn andre aspekter** du kommer på når det gjelder bruk av IKT og samhandlingsteknologi i Oasen

### Oppsummert

40. Ser du en nytteverdi og/eller **forbedring** av dagens situasjon dersom det tas i bruk samhandlingsverktøy i Oasen?
  - a. Økt kvalitet på det arbeidet som foregår?
  - b. Økt kvalitet på resultater?
  - c. Økte muligheter for markedsføring? Vil det gjøre Oasen mer populær?
  - d. Vil det lette arbeidet med ekstern kommunikasjon?
41. Tror du dette er **gjennomførbart** og/eller fruktbart på dette tidspunkt?  
Tror du at teknologien er godt nok utviklet til at den kan integreres i kreative prosesser, og ikke virke dominerende?

## 15.2 Transcription of interviews

Personal information and part of the background information about Oasen is left out. All transcriptions are in Norwegian. Quotes used throughout the thesis are translated to English.

### 15.2.1 Interview A

#### **Kreativitet og kreative prosesser:**

Begrepene, betingelser, filosofi/teori

- Praktisk vinkling – kriterier man ser etter for å bedømme om en prosess har vært kreativ og vellykket?
  - Utifra resultat og produkter:
    - Produktet av en prosess: ”Kreativ prosess dersom produktet er nytt eller en ny kombinasjon av kjente ting. En ny løsning, som enten inneholder helt ny elementer... eller ved bruk av kjente elementer men kombinert til en ny løsning.”
    - Positive resultater/skape verdier:
      - F.eks bord med og uten bein

”Vi har ikke noe vedtak i Oasen på hva som er kreativt og ikke.” Det er for tidlig å si noe om ennå. Dette er mer mitt personlig standpunkt, men ting vi har diskutert i teamet.

En kreativ prosess har mange egenskaper/kriterier

- Fører til et nytt produkt eller en ny løsning som har verdi
- Den bør oppleves som utløsende for de som deltar. Realisere potensialet som ligger i hver enkelt. ”Å bruke seg selv” – logikk, følelser, osv. Frigjør ressurser. Større realisering av egne ressurser enn det som er vanlig i andre arbeidsformer.
- At det er en positiv opplevelse å delta. Det skal være GØY! Komfortabelt, artig, trivelig, osv.
- Læring:
  - Enten av prosessen selv – måten å arbeide på
  - Eller det du skapte
- Evt bygge positive relasjoner mellom mennesker – styrke et team. Grappa som sosialt system går styrket ut av prosessen.
- ”Er samarbeid mellom mennesker en forutsetning?”
  - Vi har hovedvekt på grupper og kreativitet. Ikke individuell kreativitet. Men det er klart at i gruppene, så er det jo innsatspartnerne individer. En god del av arbeidet i Oasen er individuelt arbeid i korte perioder, som så blir satt sammen, og delt mellom fler. Men vi har ikke som hovedformål å hjelpe enkeltindivider med kreative metoder som de kan praktisere på egenhånd. Det skjer hele tida i grupper.
- A-a-k og fysisk tilstedeværelse?
  - ”Det er det vi gjør mest av, men det er ikke en betingelse.” Metodene våre er lagt opp på fysisk tilstedeværelse på samme sted. Det vil være ganske lett å omgjøre metodene slik at vi kan gjøre det via datamaskin. Enten synkront eller asynkront. Da er det noen aspekter ved prosessen som man kan gå glipp av, og noe aspekter som kan øke styrken på prosessen gjennom bruk av IKT.
- Hvilken form har produktet?
  - Formen, ikke innholdet:

- Enten ting vi har skrevet (skrevet tekst)på tavle, papir, på vegger. Tar bilde av det. Papir kan rulles sammen og tas med. Digitale foto distribueres på nett.
- Malerier
- Modeller: Fysiske modeller.
- Muntlige og dramatiserte ting: sketsjer, osv. Dokumenteres ved videoopptak. Framføringer, f.eks teater, dukketeater, rollespill, leser opp en fortelling.
- I tillegg er det ofte en muntlig presentasjon av ovenfornevnte materialer. Gjerne i plenum. Denne tas gjerne bilder og video av.

### **Eksisterende teknologi som brukes:**

Foruten om videoopptak – software og hardware?

- Ikke så mye
- Vi har brukt projector koblet til bæbar PC og Internett, gjerne også vår egen prosjekt-database. Brukt i internmøter i Oase-teamet. F.eks til å gå igjennom strategiplaner. Har gjerne sendt ut info på forhånd. Diskuterer mens en person skriver på PC. Dokumentet vokser frem på veggen.
- Det har vi til en viss grad også brukt i grupper. Som regel 1-2 personer som styrer PCen.

Samarbeidsteknologi?

- Vi har prøvd et par systemer: Groove og Mindmap i en intern øvelse (i teamet) for å se om dette var noe for oss. Vi fant ut at det er interessant, men at det krever litt mer trening.
- Vi er på utkikk etter alternativ dataprogrammer.
- Mindmap er hierarkisk strukturert – det syns vi var en begrensning

Prosjekt IKT og kreativitet – hvorfor nå?

- Mer av praktiske årsaker: tid til å prioritere det. Det har vært et ønske om å få gjort noe med et over lengre tid. Hovedsaklig hos meg og Bjørn Sortland.
- Ikke noe utviklingsstadium vi er på nå som gjør at vi absolutt MÅ gjøre det. Dette er noe vi kunne ha gjort før, vi kan utsette det, vi kan klare oss uten. Det er ikke slik at uten det så står vi helt fast.

Nye muligheter for teknologien – bedre utviklet og utbredt enn før?

- Noe bedre er det. Men hovedvekten har vært på markedet en stund. Slik som Mindmap. Det kommer jo nye ting hele tiden.

...

- Vi har også brukt mye BSCW til prosjektdatabasen vår. Ikke noe kreativt verktøy, men et driftsverktøy i Oasen . Spesielt nyttig til å dele fotoserier og beskrivelser av prosesser vi har kjørt. Som har gjort at vi kan hente frem dem, ta inspirasjon fra dem når vi skal designe nye prosesser. Felles prosessbibliotek. Veldig verdifullt.
- Nå går vi over på it's:learning og bruker det i stedet. BSCW blir jo lagt ned ved NTNU.
- I tillegg har vi laget et bildearkiv på web hvor både kunder og oss selv kan gå inn hente opp tidligere bilder av prosesser og gjenstander.

### **Forbedringspotensiale:**

Forbedringspotensial ved bruk av IKT i kreative prosesser:



- IKT letter distribusjonen og resultatet i etterkant
- 2 hovedanvendelser av IKT-verktøy
  - o Dokumentere resultatene av kreative prosesser, gjøre det lett å gjenfinne dem, distribuere dem og jobbe videre på dem. Etter en fysisk samling, møte, en kreativ prosess der man er fysisk tilstede.
  - o Det andre området, det er å bruke IKT som støtteverktøy i det å generere kreative resultater. Altså, støtteverktøy i selve prosessen. Som er med deg ikke bare som en dokumentasjon på slutten, men underveis.
- For å ta det første – dette her med å dokumentere resultatet elektronisk tror jeg er veldig viktig fordi at kreative prosesser har verdi gjennom å bli ført videre. Man klarer ikke å avslutte så veldig mye i løpet av noe timer samarbeid. De aller fleste prosjekter i bedrifter går over uker og måneder. Og da er dette med å holde temperaturen i prosjektet, holde gløden som du hadde på toppen av en kreativ prosess. Det daler litt når du kommer ned i andre oppgaver. Og så skal du ta opp oppgaven igjen ved å maksimalt bli engasjert igjen på det nivået du hadde når du var på det mest kreative sammen med gruppa di. Det er en kjempeutfordring! Og all rikt materiale som kan være med å gjenskape atmosfæren og produktet fra den kreative prosessen, og hjelpe deg å jobbe videre med det, er bra.
- Der bruker vi idag foto. Vi monterer sammen foto, så legger vi på kommentarer og tekster. Sammen med bildene for å lage mer fokus rundt det. Og vi bruker digitale foto av alle forslag som er kommet opp, flip-over og tavler og modeller og sånn.
- Vi distribuerer også videoopptak, men der ser jeg at videoopptak har begrenset anvendbarhet utifra det å kunne redusere dataene. Det er det som er utfordringen med video. Det er klart du kan ta opp et møte – da tar det akkurat like lang tid å se på det, som å være med på møtet. Og da kommer man ikke videre, for det har man ikke tid til. Det er ingen som har tid, eller få, som har tid til å sitte å se på det som har vært gjort i sanntid. Så vi trenger et prosesseringsledd mellom der som kan uten altfor mye tidsforbruk – her snakker vi om redigering av videoopptak egentlig – trekke ut essenser eller glimt sånn at vi får opp trøkket og atmosfæren igjen. Får entusiasme og lyst til å gå løs på dette videre. Uten å måtte presentere alt som foregikk.

Forbedring av infrastruktur vil da skape bedre resultat?

- Nja... Jeg snakker fortsatt om etterarbeidet jeg. Ikke om den kreative prosessen.
- Dette å bruke IKT i etterarbeidet. Det er kjempeviktig!

Syns du det fungerer godt nok?

- Nei. Nei!

Ville en forbedring eller utvikling av den teknologien gi bedre resultater (forbedring)?

- Ja! Ser for meg... og det kan godt være at den teknologien fins... sånn at der vi står idag er det vi kan og selv behersker er ikke godt nok. For det første så kunne jeg ønske en videoekspert som kunne alt. Fulgte med på alt av produkter, og redigerte dette slik at man åpenbart kunne skjære vekk det som er uinteressant. Så kan jeg komme tilbake og finne frem akkurat til høydepunktene. Som vi vil ha i en veldig konsentrert presentasjon.
- Dette her er egentlig ikke forskning. Det er mye mer tilrettelegging og bruk av eksisterende metoder. Når vi har gjort det, så regner jeg med at det dukker opp behov som kan løses vha dagens teknologi.
- Spørsmålet om distribuerbarhet – det er ikke alle som har lydkort på PCen sin på jobben. Så viss du sender opptaket på web, så får de bare frem bilder (og ikke lyd). Så det har noe med utbredelse av teknologi også å gjøre, ikke bare tilgjengelighet (av teknologi). //knytte til problemer og utfordringer// Det er snakk om utbredelse og kommunikasjon med folk som vi ikke kjøper PCer til.

.... (IKT-støtte i selv prosessen)

- Og så er det inne i den kreative prosessen. Og det er absolutt mer spennende! For der tror jeg det er mer utviklingspotensiale, og...der er det mange plusser og minuser.
- For det første bygger vi våre metoder på bruk av kropp. Altså...kroppen er et fantastisk verktøy, et laboratorie for sansing, kommunikasjon. Kropp – aktivisering av kroppen, kroppene, i grupper...i rommet, på golvet, også de fysiologiske prosessene som skjer – beveger oss, blir varme, løser opp muskulaturen – det er en masse samspill mellom hjernen og kroppens bevegelser. Bevege seg sosialt osv. Kroppsbevegelse...da i forbindelse med kreative prosesser er en av grunnelementene våre. Og da møter vi straks en konflikt med datautstyret som er veldig stasjonært. Det mest mobile kanskje er en palm, deretter laptopen og deretter en PC på en tralle. Alle de er egentlig bevegelseshemmende, de er ikke lagd for å støtte folk i bevegelse. Overhodet ikke. Så der er en stor begrensning. Dvs at med en gang man begynner å ta i dem og ta dem inn, så stopper du opp og blir stående sånn (viser stilling) og det stenger for kroppslig bevegelse! Og der ser jeg et stort utviklingspotensiale i IKT-utstyr som er mye mere som klær. Klær er jo lagd for å støtte deg i bevegelse. Klatreutstyr er lagd for det... det er tenkt bevegelse. Og da må vi helt ned på rota i IKT. Det snakkes altså om hardware og software. Jeg har sett skjermer f.eks, sånne Virtual Reality skjermer hvor det lissom har aksometere som følger hodet.... men det er utrolig uegna da! Du ser ut som en dust, skjermen er tung og... Så der er et utviklingspotensiale!
- En annen begrensning er at jeg ser at det stanger mellom kreativitet og bruk av IKT; det er at enhver/ethvert IKT-produkt er en prosedyre. Det mener jeg. Altså en blyant er jo også en prosedyre, den har en innebygd prosedyre som sier at du skal ha noe å skrive på, du skal holde den i den hånda du bruker, og så skal du gjøre sånn (illustrerer skriving). Men det er den eneste begresningen. Det er den eneste prosedyren.

Mens IKT har flere prosedyrer?

- Massevis! Bare plukk opp et hvilket som helst IKT-verktøy og still spørsmålet hvilke prosedyrer ligger som forutsetning for å bruke dette. Enormt mange! Og det er også en ting vi ønsker oss vekk fra i kreative prosesser. Vi ønsker å slippe prosedyrene fordi at prosedyrene styrer ikke bare prosessen, men også resultatene.
- Når du har piler, firkanter, rundinger, trekkanter og sånt no i Powerpoint, så blir en hierarkisk figuer gjerne fremstilt som en trekant.

.....

- Når det gjelder disse underliggende prosedyrene så tror jeg at de som skal forske på og utvikle slike verktøy bør også forske på de underliggende prosedyrene og se på hvordan de virker. Sånn ppt-pres er jo blitt et begrep! Folk er jo lei av disse bulletene som kommer flyvende fra venstre, og lydene, og... Du blir lei altså. Det blir monotont og ensformig. Så alle egenskaper ved verktøy som gjør at det ligger ikke ferdige prosedyrer der, men du må skape mye selv – veldig frie strukturer, det har jeg mer tro på.
- Mindmap og konseptsystemet (?) som jeg bare har sett på skjerm. Det er jo rimelig fleksibelt. Men jeg kunne ønske meg mye mer fleksibilitet.
- Et tredje aspekt er dette rike i uttrykket. Like rikt som å ta maling på fingrene og dra over en glassplate. Så rikt skulle det egentlig være.

Så få prosedyrer i hvert verktøy som mulig da?

- Få prosedyrer, mobilt og kroppslig bevegelse, gjerne at det fanger inn det mobile. Det kan man jo gjøre med ørten kameraer som står og mikser og lager dynamikk på en vegg når folk beveger seg. Det kunne vert ok.

- Rikdom og bredde.... male- og modelleringsverktøy på skjerm. I steden for en strek, så setter du tykkelsen, .... Så det fysiske interfacet, og da tenker jeg ikke bare på skjerm, tastatur og mus. Det er de redskapene vi har idag til å dytte noe inn i en skjerm. Det er også en begrensning. Så elektroniske tavler og alt mulig hvor du kan bruke redskaper som nærmer seg mer malerkoster, modelleringsleire og bygge gjenstander oppå hverandre og sånn. Det er det bruk for.

Er det mulig å integrere teknologien godt nok, så den ikke blir dominerende? Med dagens teknologi?

- Ja. Jeg tror at vi er hele tiden underveis. Sånn at det blir alltid nei det er ikke godt nok nå, og så i 2009 så blir det godt nok. Og fra da så vil det være godt nok. Sånn tror jeg ikke verden er. Jeg tror at alle redskaper har plusser og minuser. En del av redskapene kan idag brukes i kreative prosesser uten å ødelegge dem, uten å bli dominerende alt for mye. Så det blir ikke noe endelig svar du får fra meg på det.

.....

- Men det er et tema som vi ikke har vært innom, og det er kommunikasjon. Du nevnte det...
- For det er også et av grunnelementene – helt opplagt – i kreative prosesser når vi snakker om grupper. Der har du mange roller og som det er nå, så er det ikke så mange datasystemer hvor du kan ha multi input. Parallelt. Du har NetMeeting og du har store tavler med mange tastaturer koblet til PCen som gjør at alle kan skrive samtidig. Og vi har disse group-systemene hvor du også har koblet maskiner i nettverk. Så det er viktig at ikke skapelsesarbeidet blir monopolisert til en slags skrivesjef. Og at det beforder kommunikasjon. Og der og kunne du tenke deg mye rikere presentasjons- og kommunikasjonsmedier enn skjermen idag med den størrelsen og den stasjonære deskopen. At vi går over til ting som vises på vegg. Selvsagt kan man bruke videokanon (projector), men det må være slik at det kommuniserer godt og vi ser godt det som hver enkelt bidrar med. Og du kan bidra akkurat når du har impulsen og ikke vente til det er din tur til å skrive eller noe sånt.
- Det er noe med kommunikasjonsmulighetene også: Vi ønsker høy spontanitet og høy øyeblikkelighet. Responsmulighet. Noe som IKT-verktøyene må møte viss de skal hjelpe oss.

Awareness? Blir dette vanskeligere med IKT-verktøy?

- Det er jo noen systemer nå som holder styr på hvem som er pålogget og hvem som ser det du gjør nå og sånn. Datamaskinen kan hjelpe når man ikke er fysisk samlokalisert. Jeg synes det er veldig spennende å tenke seg kreative prosesser i distribuerte team. For jeg tror vi av og til overvurderer det fysiske samværet i forhold til det mentale. Altså når folk klarer å forelske seg på Internett, selv om det også kommer en del negativt ut av det. Så er det tydelig at en del dypere emosjonelle prosesser kan også igangsettes av IKT på stor fysisk avstand. Synkront også. Så det blir for raskt syns jeg å si at den fysiske adskillelsen vil stoppe kreative prosesser. Jeg tror det er like.... til syvende og sist så handler det jo om å få respons på det du legger frem, og ser det andre byr frem og kunne bygge opp på det. Det er liksom kjernen ved det. Og så handler det om et slags sosial trygghet, glede ved å skape sammen, sanne ting. At man kan få uttrykt og merket det også. Dette trenger man hjelpemidler for å overføre (kommunisere til andre) dersom man skal jobbe distribuert. Viss vi får noen sanne. Vi trenger ikke alt. Vi trenger ikke alle aspektene ved prosessene. Så tror jeg det kan gå.

Ulike faser i en kreativ prosess? Noen bedre til IKT-støtte enn andre?

- En todeling. Jeg tror det er kjempebehov for støtte til kreative etterprosesser. Etter brainstorminger f.eks for å bringe produktet videre.

- Og jeg har også litt tro på å gjøre det motsatte av det jeg sa i stad; nemlig å bruke prosedyrer sånn som på et kreativ samling vi hadde for oljebransjen hvor vi lagde et ferdiglagd skjema....Spørsmål som vi på forhånd ville stille på et visst stadium i prosessen.
- ....
- Det (bruk av prosedyrer) fører jo til at man anstrenger seg litt hardere for å dekke de nevnte områdene. Det hjelper deg til å konkretisere. Og gjennom det så kan du oppdage nye ideer og bli mer kreativ. IKT verktøy som prosedyrer tror jeg også kan – det er en tosidighet i dette altså (jfr tidligere om prosedyrer), jeg tror det kan støtte kreativitet og ikke minst konkretisering i den fasen (etter brainstorming). F.eks viss man bruker DeBono's seks hatter – det støttet av IKT ville være bra.

Ulike faser trenger ulike typer støtte og ulike typer verkøty?

- Ja, det er jo klart.

Den frie idefasen bør være uten prosedyrer og tekniske begrensninger?

- Nettopp. Gjerne IKT i bølgevis, men de begrensningene som er gitt må man da tenke igjennom, prøve ut og se om de fruktbare eller ikke for prosessen. Noen begrensninger er det altså. Fokusering er ofte bra for prosessen.

Viktigere med en fysisk integrering og integrering av prosedyrer i den fasen (brainstorming/idemyldring) enn i konkretiseringsfasen?

- Ja, både og. Det er gjort eksperimenter i Oasen med å utvikle et dokument i en gruppe på 4, med å sitte med hver vår laptop og la denne minnestikka (usb) rusle rundt. Og det er jo ikke en idefasen, men en produksjonsfase. Ideen er unnfanget men skal materialiseres. Tror faktisk at behovet for samvær i den perioden (konkretisering og materialisering – hva ble vi enige om) er litt undervurdert. Man har en klisje-modell om at når vi skal være veldig frie når vi skal møtes til brainstorminger, og så skal vi komme med resultat ut av det, og så skal vi gå hver til oss og jobbe med konkretiseringen. Det er jeg ikke så sikker på. Kunne godt tenkt det motsatt og. Sitte hver for oss og la ideer og så spilte vi dem ihop elektronisk på en måte, og så være veldig sammen om å skille ut de beste ideene og konkretisere videre. Og ikke gi oss før vi hadde et avsluttet delresultat. Det trenger ikke være slutten på prosjektet, men en milepæl i prosjektet. ....
- Men mye av de teknikkene brukt kan også brukes til å jobbe distribuert.

Det fins ulike faser i prosessen som en kan kombinere på ulike måter, og bruke teknologien til å støtte disse alt etter hvilke rekkefølge de kombineres på?

(f.eks distribuert idemyldring – fysisk konkretisering vs fysisk idemyldring – distribuert konkretisering = vil kreve ulike typer teknologi-støtte)

- Ja.

Forventninger til bruk av IKT i Oasen? I nær fremtid?

- Jeg har den forventningen at vi fra høsten kommer til å ha trådløst LAN. Om et par uker. Så vi kan ha laptopper rundt omkring.
- Vi kommer til å benytte projectorer og laptopper og programvare til å støtte oss i idegenerering.
- Jeg er spent på en ide om idebank. At man lager oversikt over informasjon om tidligere ideer...modeller, prosesser, teater, hva det nå kan være. At man kanskje kan indeksere denne informasjonen på en måte. Sånn at man kan si ketchup og få opp 4 ideer som har et eller annet med det å gjøre. Gjenbruk av ideer.

Dere er i en idefase hvor dere prøver ut ting? Men hvor stor tro har du på resultater?

- Om det virker. Jo, jeg tror det.

- Et aspekt av IKT som vi ikke har berørt: At IKT-verktøy kan være akkurat som å snakke med en ryddig og klok person. Eller snakke med en som er veldig god til å tegne og visualisere. Det kunne være sånn ikke sant. ....(legger ut om et eksempel)
- Datamaskiner kan visualisere ideer. En prosess-støtte. IKT gir et kommunikasjons- og visualiseringverktøy som vi ikke har fra før.
- Det andre er å strukturere; .... også kreative prosesser trenger struktur. Der kommer prosedyrekraften til IKT inn. ... (om DeBono eks). Få prosessert informasjonen som vi produserer.
- Jeg tror at det er behov for at seriøs kreativitet er både sprudlende og strukturert. Veksle mellom de to. ....Prosedyrer som et pluss når du har et mål. Og minus når du ikke vet noen ting. Da er det en hindring..... Når vi skal over i en realisering, .... da kan prosedyrer komme inn som et pluss.

Utfordringer og problem:

- Brukerterskler! Det er jo helt opplagt!

Organisatorisk eller økonomisk?

- Ja, selvfølgelig.
- De her programmene de oppdateres jo. De firmaene som lager dem vil jo leve. De lager en bedre versjon....tilbyr den, og sørger for at gamle data ikke blir kompatible med nye og sånn...De tenker oss som brukere og kunder inn på å kjøpe oppdateringer. ....Det er en kostnad, og det er begrenset hvor mye penger man bør bruke på IKT.

Økonomi et problem i Oasen?

- Ja, kostnad og tid. Det er noe med dette at vi er så ute etter rik informasjon. Et regneark er ikke akkurat svaret på en kreativ prosess.... Og med en gang du går fra ord til bilde, fra bilde til bevegelse, bilde til rom, så adderer du kanskje informasjonsmengden med en tiffaktor. Og det både koster i hardware og software. Og det koster i tid å prosessere det. Kanskje aller mest det. Det er en utfordring å både gjøre systemene frie og lite prosedyrerrettet i den ene fasen, og gode prosedyrer i den andre fasen. Kunne fange inn rik informasjon som du fort kan dele opp. Det har med brukerens tid og kostnaden på hardware og software. Og det som er midt mellom der, nemlig brukerterskler å gjøre.
- Vår erfaring er at bruk av IKT ikke bare er et individuelt fenomen, men en sosial ting. At man tar et løft i en gruppe. Nå går vi for dette verktøyet, nå lærer vi oss det. Og så gjør hele gruppa det. Det er da du får effekt av det.

Utfordring å ha et verktøy som mange veit om? Kan bruke eller assosiere seg med?

- Ja. Du ser nå at Microsoft sin suksess bygger på det. At det kommer over, at de får en 30-40% av brukerne. Så sier det bare plopp, og så har de 99%.
- Først og fremst så tror jeg at... ja, grensesnitt og fysiske forhold som mobilitet er viktig.
- Vi gjorde jo et artig eksperiment. Vi sendte folk ut med mobiltelefoner med foto på. ....Skulle ut å finne gode eksempler....De var faktisk ikke så villige til å bruke dem. Veldig rart. Alminnelig mobil med kamera. ....I allefall, vi prøvde selv først. Syns det var ganske artig. ....

Utfordringer i forhold til sosiale normer?

- Ja. Enten blir det en flopp. Det er fotograferingen på mobiltelefonen. Ellers så går det med andre ting... det er ikke noe vits i å ha en telefon uten det. Blir som å ha en telefon uten lyd. ... Kan også brukes i kreative prosesser.
- Må passe på de der masseutbredelsesmidlene og se hvordan vi kan bruke dem kreativt. Det er en ganske lur måte tror jeg. Det er veldig lett at det handler om å påvirke

software industrien til å lage nye produkter. Men det er en enormt tung prosess. Og veldig kostbar.

## 15.2.2 Interview B

### Kreativitet og kreative prosesser:

Hva legger du i begrepene? Hvilke betingelser må til?

- Betingelser ja...Betingelser for kreative prosesser, det går på de menneskene som er der. Innstillinger. Innstillinger til det som kommer til å skje er veldig viktig.
- Så har jeg opplevd at med studenter så er de lettere materiale å forme. Du kan lettere føre en prosess med dem, som de er med på... de engasjerer seg i. Men om man ser på f.eks landsbyledere, professorer da...så...da møter man en sånn motgang med en gang. Fordi de har en måte å jobbe på, en måte å tenke på som dem har besittet i mange år. Og det å forandre på det, det å gjøre noe helt nytt noe, bare det å f.eks sitte på gulvet å male. Det er et stort skritt for dem. Så innstillingen til det man driver med er viktig. Og selv om det er studenter så...kommer de inn i det rommet her og tenker sånn (lager pessimistiske lyder og grimaser)...”Så teit! Hvorfor skal vi sitte her og male? Hvorfor skal vi sitte å tegne?” Og sånne ting.
- Innstillingen er en ting. Et annet aspekt er rom. Jeg kjørte en prosess på Samfundet, i Bodegaen. Og det var veldig vanskelige forhold å jobbe under. Det at du sitter ved et bord, og sitter og jobber det...Noen ganger kan det hemme, noen ganger kan det fremme. Så rom og hvordan man sitter, og hvordan man jobber har også veldig mye å si for resultatet. Jeg har veldig troen på det med friheten til å bevege seg litt. Det har jeg. I stedet for kun å sitte med et bord foran deg, med et ark og en penn liksom. Det...når du gjør det så kommer du inn i det vante mønsteret med at nå skal jeg sitte og skrive noe, notere noe. Typisk a la forelesing. Og da ...det skjer automatisk altså... du gjør det du alltid har gjort. Men jeg tror at når man har et rom som ikke har så mye elementer, så åpner det for en ny måte å jobbe på. Og det fører til bedre resultater.

Ansikt-til-ansikt kommunikasjon – er det en betingelse eller forutsetning for kreative prosesser? Litt i forhold til en distribuert tankegang.

- Ja.... jeg fikk faktisk et lignende problem i forrige uke. Da var det noen stud.asser i EIT som kom til meg ...(legger ut om et eksempel på virtuell landsby i EIT hvor det er vanskelig å få ting til å fungere uten a-a-k)....Der går det litt på teknologien fordi.....(mer om eks). Jeg ser for meg at det er noe på teknologisiden som er hemmende. Det har noe med det. Jeg tror ofte at det har noe med tillit å gjøre også. Fordi i de prosessene som kjøres så må man ha...du må kunne nå frem med budskapet ditt. Sånn rent verbalt, men du må også ha de derre reaksjonene til de menneskene du gjør noe med. Og mange ganger så må man improvisere i de prosessene man kjører. Og da trenger man ...da trenger man vite akkurat hva skjer i gruppene. Fordi at du skal kunne forandre litt på opplegget ditt slik at det faller i smak hos de andre.
- Jeg har aldri gjort noe lignende (virtuelt), så jeg vet ikke hvordan det er egentlig.

Du ser iallefall ganske store utfordringer med å gjøre kreative prosesser virtuelt?

- Ja. Ja, jeg ser store utfordringer der.

Har dere noen spesiell teori eller filosofi som dere jobber etter i Oasen?

- Tenker du da på en sånn praksis som er viden kjent? Som alle deler her eller?

Ja, f.eks.

- Ja....jeg tror det. Vi hadde en sånn deledugnad for noen uker siden. Der vi samlet lignende personer da i Norge, fra lignende miljøer. Og da ser jeg at Oasen har en annen tilnærming, en sånn annen måte å tenke på og jobbe på som er litt forskjellig fra

andre steder. Jeg vet ikke om jeg klarer å sette ord på akkurat hva det er...hva den derre filosofien eller hva de grunnleggende verdiene er

Men, klarer du å si hva som pekte seg ut som forskjellig fra de andre?

- Ja....(lang pause)...jeg tror det har noe med åpenhet å gjøre, og det å se mulighetene for at...se mulighetene i enhver situasjon for hva som kan gjøres bedre, eller mulighetene for at ja. Eller åpenhet. Selve undringen. Det å konstant undre seg over ting. Det å snu på steiner som man egentlig har snudd på mange ganger, men som ...

Vil det sei at andre (lignende steder som Oasen) kanskje er mer strukturerte, mer konkrete, eller har et mer konkret metoder å jobbe på?

- Kanskje. Jeg tror kanskje det.
- Jeg tror kanskje at Oasen er litt lite målrettet sett sånn i forhold til andre miljøer.... Det kan jo innebære både fordeler og ulemper. At du har en trang til å endevende ting...

Dere trekker kanskje en del stier (ideer) som ellers ville blitt lagt bort da?

- Kanskje.

Hvilke faser vil du grovt si at en kreativ prosess består av?

- Sett fra en prosessleder, eller fra en gruppe liksom?

Er det en forskjell?

- Eh ja... det er sikkert en forskjell....(mumling)....faseskifter da.

Ta begge deler da. Start gjerne med prosessleder.

- Som prosessleder så må man...du har den derre forarbeidsfasen. Prefasen. Der du må i dialog da med den gruppen eller den personen som du skal kjøre prosessen for. Du må finne ut hva personen vil ha. Så da setter jeg meg ned og...med kunden som vi sier da... Kunden har en del tanker om hvordan opplegget skal være. Eller hvordan utfallet av opplegget skal være. Så da kaster man frem litt sånn derre metoder eller scenarioer på hvordan man kan løse dette her for å få fram det utfallet som kunden vil ha. Kunden går hjem, og så sitter vi der da og pønsker .....Vi vil ha det som output, og hva må vi da gjøre for å få det outputet der. Hvilke øvelser, hvilke metoder, hva slags praksis skal man utføre...Så lager man som prosessleder (et forslag) gjerne to. Gjerne helt forskjellige, slik at de har hele spennvidden i det. Det er forfasen.
- Og så kommer selve dagen. Da prosessen kjøres. Menneskene kommer inn i rommet og de gjør det de skal gjøre. Så kommer et resultat ut. Men så...så er det en del arbeid for prosesslederen. Så lenge du planlegger prosessen bra, så vil alt det som skjer i dette rommet, innenfor de fire veggene, det går greit. Det er alltid noe som må endres underveis. Små ting som man må ta på strak arm.
- Så er det den derre etterfasen. Der er det snakk om viderefølgning av prosjektet. Og en dokumentasjon av det som er blitt gjort. Ja.

Er det mye arbeid i denne etterfasen (ikke ordrett stilt spørsmål, men noe i den dur)

- Både ja og nei tror jeg. Det som er problemet....det er snakk om informasjon...man binder videoklipp og sånne ting. Det å prosessere, klare å trekke ut essensen av det Det tar mye tid altså. Det å lage et sånt apparat som klarer å dele alt det vi har erfart da, og den dokumentasjonen, det..

Sett fra en gruppe synspunkt da?

- Gruppene har en ....Det er veldig sjelden at gruppene på forhånd er forberedt. De har ikke så mye forarbeid. Noen har det, men at det er mye mindre grad enn det prosesslederen har. Så kommer dem hit i rommet. Og gjør sin greie. Resultatene av det, og her ser jeg det er veldig kritisk fordi det som skjer i dette rommet er nå/da-øyeblikk. Det skjer akkurat her, og det skjer akkurat da. Men i det øyeblikket de går ut av den døra der så tror jeg at det dem har lært her blir liksom...Det var gøy, det var spennende, det var kreativt akkurat her, men i det øyeblikket de går ut av døra så tror

jeg dem glemmer mye da. Og der har vi en jobb å gjøre i forhold til det å det praktiske i det rommet her videre under .....//???

Hvilke produkter/resultater skapes?

- ....Jeg kan nevne /// ?? rapportene. Resultatet av de to timene jeg var i aksjon var (under prosess i Bodegaen)...vi skulle lage et scenario for fremtidens kollektive transport. Og det var et ledd i en konkurranse. Vi skulle lage en presentasjon; både skriftlig og verbalt. Som skulle bli presentert for en jury, og bli bedømt.
- ....Og så har vi et....jeg tror at de fleste prosesser som kjøres, uansett hva slags prosess det er, så vil man alltid prøve å få noe konkret ut. Sånn at når man går ut av rommet her, så skal man prøve å ha et papir, noe fysisk på at dette her har vi skapt i løpet av de to timene som vi har vært her.

En mest mulig konkret bestemmelse før de går ut av døra?

- Ja.

**Eksisterende teknologi i bruk:**

- Altfor lite! Vil jeg påstå.
- Jeg tror at...mye av teknologien som blir brukt i dag er på dokumentasjonssiden. Det at vi lagrer prosessene digitalt: Powerpoint eller lignende formater. Vi tar bilder av det som skjer i rommet her. Vi filmer. Og så publiserer det. Til hverandre og til da...
- De verktøyene som kjøres i dette rommet her er så og si kun analoge. Jeg tror ikke det er noen digitale verktøy.

Har du/dere brukt samhandlingsteknologi i Oasen?

- ....Hva definerer du som samhandlingsteknologi?

Det kan være så mangt; alt fra kommunikasjonsverktøy, LMS, osv.

- ....Ikke i prosessene som føres tror jeg. Nei, det har vi ikke gjort. På interne møter så har vi hatt litt MSN-bruk, videokonferanse og telefonkonferanse.
- Nei.

Hvorfor er prosjektet "IKT og kreativitet" tatt opp nå? Hvorfor er det ikke tatt opp før? Eller senere?

- .....(lang pause)...jeg tror at det er to, eller et par ting som gjør at det er aktuelt akkurat nå; og det er at tiden er moden for det. At de verktøyene som er blitt utviklet nå; organisasjonsverktøy, kommunikasjonsverktøy og sånn derre mindmanager og mindconcept og sånne ting. Jeg tror at det er blitt utviklet...at de er blitt så bra da at vi rett og slett bare "svopp" prøve dem inn her. I dette rommet her. For et par år siden så var det kun .....//?? Det er en stor sånn terskel å komme over, det å ta det inn her, for da må du gjøre det sånn (knipser med fingrene). Vi må ikke bruke tid på å feilsøke og...det har vi ikke tid til rett og slett. Det er en ting.
- En annen ting er at jeg tror at det har noe med min...at jeg er kommet inn. At de kan bruke den tekniske kompetansen min her. Prøve ut selv da.

Har det vært et ønske lenge om å få IKT inn i Oasen? Eller?

- Blant noen så tror jeg det. Jeg tror at de prøvde i det RIK-prosjektet. De testa .....//?? Så blant noen tror jeg det har vært ønske om det.

**Ønsker og krav til ny teknologi:**

Kriterier?

- Ja....Kriterier, det må være f.eks at...at flere mennesker kan bruke verktøyet samtidig. Det er ikke sånn en og en. Det er ikke sånn at en sitter foran en PC..."nå skal jeg tegne



noe eller skrive noe, så kan du gjøre det etterpå”. Jeg ser for meg at alle fem personene, eller hvor mange som er på gruppa, må kunne gjøre det samtidig.

Multi-user input? Flere på samme enhet samtidig?

- Ja. Jeg tror det er veldig viktig. Det er en ting.
- To: Og som egentlig ligger i IKT-verktøy er jo at det skjer digitalt. At resultatet av det du lager blir lagret på maskinen. Så du kan veldig enkelt distribuere det til flere personer.
- ....(lang pause)...noe mer?....

Viss du tenker mer i forhold til Oasen, utformingen av rom...

- ....(lang pause)...
- Jeg har sett ??? tavler som er digitale. Det du tegner eller merker på tavlen skal da lagres automatisk. Og at da flere personer kan gjøre det samtidig.
- Nei....

I forhold til brukeren da; noen spesielle kriterier du vil sette sånn sett?

- ....(lang pause)...

Med tanke på grensesnitt? Utforming?

- Intuitivitet. At det er intuitivt veldig lett å bruke. Det må jo være et ganske greit kriterium.
- ....(lang pause)....
- Det jeg tror da, er at....alle de digitale verktøyene er egentlig en forenkling av de analoge. Uansett hva man ser på så kommer de analoge først, og så kommer de digitale etterpå. På en måte så må man ivareta det å kunne gjøre det analogt. Det må nesten være like bra, eller bedre da, enn det å jobbe...de digitale verktøyene da må være minst like bra som de analoge. Du skal ikke minste noe. Det må være like effektivt. Det du skaper med et digitalt verktøy, må være like bra som det du skaper med et analogt.

Viss man tenker utforming av rom: Ser du for deg teknologien integrert i rommet eller ser du mer for deg artefakter som folk kan jobbe med? Eller begge deler?

- ....Jeg ser for meg at dersom man skal putte inn noen store IKT-verktøy i Oasen, så burde Oasen vert litt større.
- Og jeg tror at...man kunne lagd sånn derre stasjoner. Viss du har en prosessløype da fra A til B, så har man en metode her, analogt eller digitalt, og så går man til et annet sted i rommet, og så gjør man en ting der, analogt eller digitalt, osv, osv. Men de må være så fleksible (stasjonene) at man egentlig kan stokke dem om da, den ene gangen kan de være der, og den andre gangen der, osv.

Mobile da med andre ord?

- Ja. Jeg tror ikke vi skal lage sånne der statiske stasjoner.

I hvilke deler/faser av prosessen er det mest nyttig å ta i bruk IKT eller samhandlingsteknologi?

- Det er et spørsmål som Ole (siv.ing-student som har dette som diplom-oppgave), håper jeg, kan hjelpe meg med å svare på. Jeg har faktisk ikke en hypotese eller teori på det. Jeg har ikke det altså.

Viss jeg sier min hypotese da?

- Ja?

Da ser jeg for meg at i en idemyldringsfase kan det være vanskelig å ta inn IKT, mens i en konkretiseringsfase/resultat vil være det enkleste. Jeg ser for meg en kurve hvor jo lenger ut i prosessen man kommer, jo enklere blir det å ta inn teknologien. Kan det stemme?

- Jeg ser den. Den er ikke så dum. Jeg tror jeg støtter den der. Ja.

**Utfordringer og problem:**

Ser du noen konkrete eller umiddelbare utfordringer og problem?

- Ja! (he-he-he). Det er jo det.
- For det første så må man bli så husvarm med de ulike verktøyene at det går sånn (knipser med fingrene) å ta de inn. For vi har ikke tid eller råd til å eksperimentere med ...vi kan eksperimentere med oss selv. Fordi med de kundene som vi har...så kan vi ikke det. Så den prosesslederen som tar i bruk de verktøyene må være så sikker på da at jeg håndterer dette, jeg klarer dette her, og jeg klare å formidle det til gruppa. At vi klarer å ta det i bruk.
- Jeg tror at med en gang vi har IKT verktøy så har det...vi kommer til å få fryktelige problemer med en eller annen teknisk greie...da er det stuck.
- Selv om du får noen uventede resultater, får bedre resultater, så kompliserer det ting ved å innføre IKT-verktøy.

Organisatoriske eller økonomiske problem?

- Ja...Organisatorisk så må man drive kompetansebygging. Der er jo forskjellig hvor mye vi klarer å ta til oss .... Det er den ene tingen.
- Økonomi har noe å si. Det er jo snakk om lisenser og produkter som må betales

Hvor villig tror du Oasen er til å satse på IKT? Bruke ressurser på det?

- Jeg tror det er blitt satt av en del ressurser, som er satt til å få tak i en del midler. Gjennom den der xxx-søknaden. Men uansett om det går eller ikke, så er jo Oasen villig til å ta av sitt eget budsjett.

Så økonomisk sett, så burde det ikke være noe problem å innføre IKT i Oasen?

- Nei....jeg tror ikke det. Men på den annen side så...jeg tror at utvalget av IKT-verktøy kunne vert større dersom man hadde litt bedre økonomi (større mulighet til å kjøpe inn det man ønsker). Jeg tror det.

Er det noen negative påvirkninger ved å ta i bruk IKT i prosessen? Kan det ødelegge prosessen på noen måte?

- Ja, jeg har sett noen skrekkszenarioer på det...at....jeg tror det faller ut begge veier. At...når man er her i rommet her, når du har den der flyten, at ting går automatisk, og så plutselig så dukker det...eller du er i en gruppe, og så må dere plutselig sitte ned og skrive på dataen og sånt no. Du får det der bruddet, i den rytmen. Jeg må ærlig si at jeg er litt engstelig for det der.

At den kroppslige/fysiske utfoldelsen kan stoppe opp?

- Ja. At det blir litt statisk.

Kan det være lettere å unngå dette i en konkretiseringsfase? //// Gjelder dette også i konkretiseringsfasen?

- ....nja.....

Vil det bli annerledes enn f.eks å konkretisere på papir?

- ....(lang pause)...Som jeg sa så...vi har vert analoge ganske lenge, det å liksom ta pennen og skrive for hånd og sånne ting. Det vil være en sånn overgangsperiode før folk klarer å...ja mellom det å være analog og digital. Noen har lettere for det, men andre har ja store problemer med det. Men om det er store forskjeller på det å produsere ting pr hånd eller pr tasting?

Er det lettere å miste fokus i prosessen? At verktøyene tar for mye oppmerksomhet rett og slett?

- Ja.

At det kan bli for spennende å holde på med verktøyene?

- Ja, eller verktøyene blir en slags hindring. De må være intuitive, du må skjønne de. Du må ikke bli forklart det så mange ganger. Det er akkurat det som er...en av det

viktigste tingene som prosessleder er at instruksjonene dine må være så klare og så konsise at du ikke må si det mer enn en gang. Du sier det en gang, så skjønner de det og setter i gang med det. Med en gang du forklarer for andre eller tredje gang, så begynner folk og sånn dere ”åhh” (irriterte lyder), ”hva er det han prøver å si?”, og sånn derre. De blir usikre på hva de skal gjøre, og de bruker energi på å være negative, litt surmulende. I stedet for å bruke tiden på å være kreativ. Det å skape noe. Det å få frem noe. Og det tror jeg kanskje er noe av den bekymringen jeg har i alle fall fordi....det å bruke IKT-verktøy, video og så ”åhh”(irriterte lyder), ”hva er det jeg skal gjøre egentlig?”, ”hvordan skal jeg bruke dette her?”.

### **Forbedringspotensiale:**

- Jeg ser veldig store potensialer på det videre arbeidet. Det som blir skapt i det rommet her, at når du går ut av det så har du det der ute. Fordi /// du skal kunne ta de rette avgjørelsene. Alle skal se det. Det forenkler en del ting.
- Et annet aspekt som er viktig er at...den derre...når du har vert her inne, du har skapt noe, så har du....du har vert kreativ, du har vert skapende. Så er det liksom en slik oppadstigende kurve. Men i det øyeblikket du går ut av dette rommet her og skiller lag med de du jobber sammen med, så går kreativiteten eller skaperevnen ned igjen. Neste gang man møter de igjen, så går den litt opp igjen. Men du kan...du får liksom ikke den derre ....når du går ut av dette rommet her så, du må egentlig ha en sånn mindre dalende kurve. Og jeg tror at ting blir ivaretatt ved at ting blir digitalt. Bilder, og video, og avgjørelser og tegninger og...

Hva med forholdet til kundene? Forbedret markedsføring? Økt tillit overfor kunden?

- .....(lang pause)....Jeg tror at...i den forberedelsesfasen. Når man ///?. Viss man da lagrer ting digitalt, så blir det mye lettere å vise frem for kunden. Så kan du sånn ”smokk” (raskt) sende ut til kunden hva du tilbyr. Da ser de konkrete resultater av hva ...///?.

Tror du at bruk av IKT-verktøy vil føre til at bedriftene som er her vil anse dere som mer seriøse?

- Jeg tror ikke at det vil gjøre at bedriftene ser oss som mer seriøse, men at...det at repertoaret øker....at det er veldig positivt. At Oasen har flere strenger å spille på.

### **Begrepet ubiquitous computing:**

Hva er dine tanker om dette begrepet? Ubicomp? Allstedsnærværende PCer?

- Allstedsnærværende PCer?

Integrering i omgivelsene, i klær, i rom, digital verden....

- .....(lang pause)....Jeg er ikke sikker på om jeg forstår begrepet jeg.
- Mener du intelligente klær f.eks?

F.eks

- ....Det er to ting som popper i hodet mitt: det er den (peker på noe) og så han derre engelskmannen som...(implementerte teknologi i menneskekroppen?)

Det var kanskje litt drastisk.

- Nei...jeg har ikke noen problemer med å ta i bruk, eller se potensialer for sånne ting tror jeg. Tenker du da på om slike ting kunne puttes inn i dette rommet her eller?

Ja...

- F.eks hva da? Har du noe sånn....

Artefakter, møbler som kan lagre informasjon f.eks.

- Som f.eks?

Et whiteboard teppe? Meir integrering av videoopptak f.eks. ....(legger ut om muligheter, og hvordan disse kan integreres i rommet uten å ta bort fokus fra prosessen.).

....(samtalet sklir ut i mange eksempler)

- Det hadde vært tøft å prøve et sånt lignende system (whiteboard-eks fra Nederland). Og det røde teppet tror jeg også hadde vært en veldig god ide.
- Men det der går jo litt på det med økonomi og teknologi og sånne ting da.

### 15.2.3 Interview C

#### Om kreativitet og kreative prosesser

Hva legger du i begrepene, og hvilke betingelser må være til stede?

- Jeg snakker ut fra min ide om der først. Kreativitet er...altså hva kreativitet er?

Ja?

- Kreativitet tror jeg er en holdning. En holdning til at man hele tiden er på idegenereringssida. Og så tror jeg det er som en muskel. Det kan trenes opp og trenes opp. Og det er det vi gjør her. Og det tror jeg kanskje vi er litt gode på. Trur virkelig at det kan alle bli ganske gode på.
- Som en muskel ja, som kan trenes. Det er klart at da kan man bruke mange metoder og mange verktøy for å trene kreativitet. Så jeg har ikke den holdningen om at kreativitet er det kunstneriske litt sånn at man bare er det. Noen mener det. Og det er greit. Men jeg er litt mer sånn at... det er mer en modus da. Som man kan bestem seg for. Noen er jo der nesten hele tida. Jeg kan være ganske mye i den modusen selv.
- Men det er så mye i samfunnet som blokkerer for det (kreativitet). Det er liksom ikke vanlig. Ikke engang i skole og utdanning.

Hva er det som blokkerer?

- Jeg tror at man har veldig mange måter å undervise på hvor man søker etter et svar og ikke etter muligheter. Jeg ville hatt mer mulighetsundersøkelse, mer utforskning, mer nysgjerrighet. Uten at det skal komme så mange svar. Så sånn sett så må på en måte det som skal gi rom for mer kreativitet fokusere veldig på prosessen. Og ikke så mye på resultatet. I hvert fall ikke i første hånd. Fordi det er liksom det å gå litt uttafor. Kanskje bare stole på at det havner et sted. Stole på at alt det andre enn det logiske som skal fra A til B. Men gå sidespor, gå innom magesfølelser og sånne andre måter. Og det tror jeg blir gjort for lite. Virkelig! Det er en sånn hjertesak for meg faktisk! Meg barn og ungdom og de greiene der.
- Vi er jo inne på det nå i Oasen med hele undervisningssystemet, universitetssystemet og doktorgrad og...Hvordan skal vi faktisk finne på nytt?

Betingelser? Spesielt her i Oasen?

- Ja, det er jo faktisk ganske mange det. Viss jeg nå holder meg til Oasen først:
- Aller først kan jeg si at kreativitet som en holdning krever egentlig veldig få rammer. Egentlig. Viss man har det i seg og har trent det opp. Så er det jo helt rammeløst. Da kan man sitte hvor som helst og være sammen med hvem som helst.
- Mens typisk her oppe så får vi jo folk som er i noe helt annet til hverdags. Og det kreative rommet er noe uvanlig. Så da har jeg opplevd at det virkelig kreves en del i forkant. For det kan faktisk mislykkes helt viss man ikke er forberedt. Så vi har alltid formøter med flere enn en person. Si at det er en prosess da som skal lages. Sånn at vi klarer å forankre det inn i ikke bare en persons ide, men flere. Det er sånn grunnleggende at de som kommer hit må ha en eller annen motivasjon til å gå inn i det. Ikke bli tvunget inn i det. Altså tvang til kreativitet det tror jeg ikke så mye på. Det er ganske lyststyrt. Man må ha en motivasjon tror jeg.
- Og så har vi også andre ting her. Bare sånne små ting som å ta av skoene. Det må man og gjøre mange andre steder. Men her gjør vi det fordi at rommet er lagt til rette for å sitte på gulvet. Det å sitte på gulvet ikke sant, det er en mulighet til å bruke hele

kroppen. Det er et rom som innbyr til det. Og veldig ofte så innbyr vi til det i prosessene eller i en oppvarming eller...at man ikke sitter rolig hele tida. Det er ikke en sånn helt nødvendighet, men vi tror at det er en sammenheng mellom hodebevegelse, hode og kropp da.

- Sånn som ut i mer mitt spesialfelt som går på rom, lokaler, farger og helt ned til møbler og stoler. Så mener vi å se det ganske tydelig. Stoler som du lener deg tilbake på og sitter godt i. Dem initierer en annen holdning, en annen måte å være på enn viss du f.eks her hadde en sånn ståkrakk med rullende understell hvor du ikke har støtte til ryggen, men må bruke beina...du blir aktiv på en helt annen måte. Og det påvirker gruppa. Spesielt når det er en gruppe. Fordi med en gang noen setter seg sånn (tilbakelent), så...Kroppsspråk er kjempeviktig i en prosess. I alle prosesser. Men spesielt, men selvsagt også i kreative da. Hvor det er ideen at man liksom skal frempå.
- Så er trygghet veldig viktig. Derfor så prøver vi å varsle om at man tar av skorne. I god tid før dem kommer hit. For det kan være et sjokk for mange. Det kan være å gå over noen grenser. Det å skulle ta av seg på beina, eller skulle skrelle av seg mye av en sånn fast faglig ramme sant. Sånn at det.. det må være litt forberedt.
- Og trygghet i det rommet (peker på prosess-rommet i Oasen). Da har vi også måter som vi kaller ”å komme tilstede” som er en sekvens som vi nesten uten unntak kjører. En fase av en kreativ prosess. Vi har mange metoder i den, mange måter å gjøre den på, men å komme til stede betyr både mentalt for hver person, og det å føle seg trygg i gruppa og i det rommet. Alle tre er like viktig. Dem er kjempeviktig! Trygghet.
- En åpning litt utenom det vanlige. At man kommer inn i dette her med nysgjerrigheten. At det er rom for å si litt rare ting. Rom for en undring eller ... man møtes som noe litt annet enn å si alle titlene og sånn da.
- Og så kreativ prosess. En annen kjempe... Hvor mye skal jeg si da?... En annen sånn for at vi skal få det til å virke... Så har vi veldig tro på et sånt...hva er det ordet?... flerspråklig...at man bruker hele kroppen...?

Kommuniserer på flere måter?

- Ja, kommuniserer på flere måter. Ikke bare med ord. Sånn at viss ikke bare jeg skulle snakket nå, men mange i en gruppe, så hadde det kanskje vert samlende å snakke rundt den (en murkloss som ligger på bordet)f.eks. Det å ha et veldig skarpt fokus på noen ting. Det tror vi er viktig i det kreative. Sånn at man rett og slett snevrer inn noe innmari begrensningens mulighetsrom. At man velger en eneste ting og begynner med den. Det er jo sånn metodisk da, men det virker samlende på en gruppe. Sånn at en kreativ prosess her er ganske styrt og fokusert på noen sanne knappenålshoder gjennom en prosess. Fordi at vi vil at man på en måte ikke skal gli ut, gli for langt ut i diskusjon. Men man skal liksom samsnakkes om akkurat en ting. Det er selvsagt metoder hvor det er et poeng at man skal liksom bare...laaangt ut og vidt og bredt.
- Det er veldig sjelden vi har helt vanlige diskusjoner. Veldig ofte så styrer vi det at ..at da får én lov til å snakke ferdig, i en kreativ prosess. At han på en måte for lov til å si hele visjonen sin, eller hele tankerekka. Fordi ofte så kommer man bare til et halvt poeng. Og så begynner man liksom (viser at ting baller på seg)... og så har diskusjonen gått i en helt annen retning. Så en sånn samlende. Enten noe felles eller en persons...noe sånn felles da, ikke sånn i alle retninger. Det er også en holdning om fokus og om å lytte. Om å være innstilt på å så lytte da. Og når de andre da går på, at man klarer å bygge på det som er sagt og ja... Så det er faktisk en del regler.

Hva er det som gjerne blir brukt som fokus? Problemstilling? Artefakt? Ideer? Eller?

- Det varierer jo veldig. Men som et sånt eksempel med den steinen (murklossen på bordet). Og den tror jeg du har vert borti du og? Det er en sånn Askeladden som vi bruker mye. Askeladden er kanskje ikke riktig ord på alt vi bruker, men vi bruker

gjenstander og artefakter da.. å snakke igjennom som metaforer. Og det kan man gjøre både som en sånn åpning, bli kjent, eller snakke om seg selv gjennom den. Eller man kan ta det inn midt inni et...hvor man står fast. Det er ikke så vanlig. Men...ja. Det er en type...objekter. Og det som da er viktig er at ....altså objektene bruker vi for å...for det første så har den en materiell form og folk begynner å ta på den. Dem føler seg faktisk ofte trygge fordi dem har noe å holde i, noe å konsentrere seg om. Så de føler seg faktisk trygge. En ren sånn psykologisk fenomen. Noe godt i det. Fremfor å sitte sånn (viser en tilbakelent holdning og ”nervøse” hender). Så det er kjempe!

- Og så er den materiell sånn at den kan også appellere til lukt og smak, mye mer det sanselige. Som vi tror at ideer kan komme gjennom. Vi tror at mennesker får ideer på ulike måter. Noen får dem som bilder. Ok, man tenker bilder når man ser dette her. Noen får minner. Noen får det fordi dem kjenner på den, får det på en måte taktilt gjennom kroppen. Noen får det kanskje gjennom et ord; murstein- mur –osv. Sånn at...men vi kan helt klart ha andre fokuser også.
- Man kan ha fokus f.eks gjennom en SWOT-analyse. Det kjenner du kanskje?

Nei.

- SWOT er fire bokstaver som står for S – Strength, W – Weakness, O – Opportunities, og T for Treaths. Da er det jo ord. Det er liksom begreper. Og det kan også være et fokus. Enten for en gruppe eller en bedrift eller...som man skal finne ut styrker og svakheter.

Faser? Hvilke hovedfaser går igjen?

- Det er ”komme-til-stede”. Har vel sagt at den nesten alltid er med. ”Komme-tilstede” først, og så har du ”åpning”/åpningsfasen. Gå inn i mulighetsrommet.
- Og så...det er litt sånn...”skape” har vi kanskje etter der igjen. Som en mer sånn større arbeidsøkt. Men de to er jo mye det samme. Av og til kan man ha en sånn analyse eller fakta, eller sånn virkelighetsbolk. Og...så har du noe med valg og konseptualisering. Og til slutt landing med presentasjon, med debrief. Vi har ikke alltid alle med. Analyse er kanskje den vi har minst med. Sånn uttalt. Men den kommer jo inn i form av noen metoder vi bruker.

Sånn grovt sett, så kan vi dele inn i idemyldring/skaping – konkretisering og presentasjon?

- Ja.

### **Eksisterende teknologi i bruk**

Hva er i bruk nå?

- Det vanligste, sånn som i det kreative, er kamera. Digitalt kamera, og så vidt litt video. Det har jeg ikke gjort noe særlig sjøl. Men vi er litt i gang med video. Har gode erfaringer med det.
- Kamera, altså bilder, er kjempeviktige! Fordi det er veldig vanskelig å si med ord hva vi gjør her. De fleste som har vært her vil sikkert ha den samme opplevelsen med å formidle det videre eller..forklare hva dem har gjort. Altså bildene er veldig viktige. Fordi vi bruker dem, vi jobber veldig mye visuelt faktisk. Det visuelle....det fins det en danske teoretiker på som jeg ikke husker navnet på. Men det å bygge visuelt, det å jobbe med installasjoner, det å ...det er noe vi tror er kjempeviktig. Og det binder folk sammen. Det er så enkelt å forholde seg til. Det går an å ta opp igjen ting og...ja.

Har dere prøvd ut noe spesielt som går på samhandlingsteknologi og samarbeidsverktøy?

- Nei, faktisk ikke. Det har vi ikke.
- Eller jo, det har vi. Vi har det. Litt i det sideprosjektet RIIK. ....(småprat om RIIK). Da brukte vi Smartboard. Og...så brukte vi ganske aktivt videokamera. Og vi brukte også kameraet som en del i en jakt. Vi hadde et stikkord, jeg tror det var knute. Så filma vi, på en måte fotograferte, og prøvde å fange tankerekka via kamera. Fra et

stikkord. Det var spennende. Og så etterpå når man ser på den, så tror jeg vi så på den som en smartboard. Og prøvd og liksom koble oss videre på. Men det var den var veldig fullstendig uten målstyring. Men prosess og utforskning av selve verktøyet var poenget da.

Syns du det fungerte bra?

- Syns det er veldig vanskelig å måle det når man ikke har noe mål. Men... veldig artig. Jeg tror at det ligger noe i det som gjør det veldig rikt og veldig tilstede. Så er det mulig å dele akkurat den tilstedeværelsen med andre etterpå. Den har man jo ikke sjans til å dele bare med bilde heller. Og også del noe av den logikken, eller begynne nesten å forske på hvordan skapes ideer. Det er veldig spennende. Med den lille fotosesjonen som vi gjorde på knuter, hvor vi var, hvor jeg kanskje som designer eller kunstner ser noe annet enn en professor i...data. Det syns jeg er veldig spennende.

Om prosjekt IKT og kreativitet – hvorfor nå?

- Jeg tror det har vært aktuelt lenge. Klarer ikke å svare akkurat.
- Jeg tror at vi som er her...jeg tror det er noe i at vi må være trygget her, i det vi har her først. At det er litt viktig. At vi må ha en base i det fagområdet.
- Og så tror jeg det er litt at vi tror at det er noe å vinne i forhold til flere ting: projectorer, kvalitet, rikhet, på hvordan formidle det videre. Og så.. ta på alvor den rikheten som ligger i det som verktøy. Sann som vi gjorde med knute da.
- Et verktøy i tida. At vi også bør ha det her inne. Vi er liksom så mye ned i den mursteinen og det sanselige som er forankra i det basis mennesket. Men det er veldig spennende å prøve å ta inn andre (verktøy).
- Det siste er faktisk effektivitet. Ja. Fordi det koster oss, det koster mye å ha de prosessene. Kanskje først og fremst sann mentalt. Det tar veldig mange timer. Det koster mye penger for kunden. Det er så dyrt at man kanskje ikke har råd til å gjøre det. Og det er også litt sann ekskluderende i det.
- Mange ideer om at mer tilgjengelighet ved bruk av verktøy, sann at flere kunne hatt det. Da tenker jeg vel mest på software. Som har vært diskutert litt.
- Og så lette disse prosessene med å få de landet, få det bakt inn, få de brakt videre. Det er i liten grad faktisk at vi klarer å ta vare på til neste generasjon det tankegodset som kommer ut. Det er veldig i deltakerne. Så har vi de bildene, vi har noen stikkord og litt sann skriftlig som også tar vare på det. Men jeg tror ikke det er godt nok da.

Fange det som skjer og formidle videre, men ønsker dere å satse på distribuert eller vil dere holde prosessene her i Oasen, sann fysisk?

- Hmm...Tenker du distribuert, at det på en måte skjer via datateknologi?

Ja, f.eks video eller...

- Jeg tror at det er et kjempemarked. Det tror jeg. Jeg ser at noen av de kundene som har vært her, store bedrifter som jobber overalt, så tror jeg det er en mulighet. Jeg har litt sann...det er ikke det jeg selv har lyst å jobbe mest med sann først. For jeg tror at det er en jobb å finne ut av hvordan det påvirker folk først. Og hvordan faktisk få jobba kreativt med IKT-verktøy. At det kanskje må løses først. Det er en del annen psykologi som kommer inn i bildet når det er avstand mellom mennesker. Og her legger vi jo veldig vekt på tilstedeværelse og nærhet. Og kroppslighet liksom. Noe sann ordentlig basis-mursteiner. Så viss man tar det vekk, og skal få til...hva får man til da? Men det er forferdelig spennende. Noen må kanskje gå inn og se på... man må få det til å virke her først tror jeg. Og så er det kanskje ikke det samme som vil virke der.

Hva med distribuert i etterarbeidet? I forhold til Oasen? Det ligger kanskje mer potensiale i det enn å ta hele prosessen ut av den fysiske tilstedeværelsen?

- Ja, nettopp. Det høres forlokkende ut. Jeg selv...jeg har jo aldri prøvd en sånn fjernprosess eller groupware.
- Jeg burde rett og slett prøve det. Jeg er litt redd for det, og jeg burde prøve det snarest. Så jeg snakker litt uten erfaring, både av redsel og samtidig som jeg kanskje tror at de er MYE mer muligheter enn det faktisk er. Fordi jeg ikke aner noe om det.
- Men vi har jo ekstremt vanskelig for å få inn evalueringer. Bare det hadde hjulpet.

### Ønsker og kriterier til ny teknologi

...(småprat og forklaring av hva som ligger i spørsmålet)

- Alt skal være grønt? Nei, nå tuller jeg.

(spissing av spørsmålet) Hva er de absolutt viktigste kriteriene når man skal trekke teknologi inn i kreative prosesser i Oasen?

- Jeg tror den må ha et grensesnitt, en sånn intuitiv forståelse blant folk. Altså viss du da tenker deg prosessdeltakerne som skal bruke det. Det må være noe som er ekstremt enkelt, tror jeg. Enkelhet. Fordi ...ja det tror jeg må være det aller viktigste. Det må være som å ta et hvitt ark altså. Det vet man hva man skal gjøre med. Så kan man faktisk rive det i to. Og man kan tegne på det med blyant og penn og... Nå drar jeg den litt langt, men...veldig enkelt. Det er kanskje viktigere enn at det kan gjøre alt mulig. Jeg tror heller at jeg ville heller hatt flere ulike IKT-dingsebomsers med helt spesifiserte ulike funksjoner enn å ha en som gjør alt.

Med tanke på kommunikasjon da?

- I prosessen?

Ja, både i og eksternt etterpå.

- Sånn uttrykksmessig eller hvordan det virker?

Er det noen spesielle kriterier som gjelder for kommunikasjon inne i prosessene i Oasen?

- Av og til er det jo...hva skal vi si...taushetsplikt. Vet ikke om det er sånt du mener. Men av og til så er det jo sånne ting å ta vare på. At det er prosesser som er over mot litt selvutvikling eller ikke sånn uten videre noe alle skal sitte og gasse seg med. Men som blir sagt der og da, og så på en måte tar man det til seg, og så er det borte. Det er jo ikke sikkert at dem skal inn noe sted ( i teknologi).
- Og så er det også av og til noen sånne klausuler på ideer. Som oftest så er oftest så er alle ideer som skapes i rommet fritt vilt. Det er veldig sjelden at vi har hatt noe annet. Men vi har hatt prosesser hvor man på en måte er inne på patentering og sånn. Og da gjelder jo litt det samme ( at de ikke bør gå inn i teknologien og videreføres/videreformidles til andre).
- Og så er det mye som folk gjør her som...vi må alltid ha godkjenning på foto. Vi har ikke lagt ut noen prosesser på nett. Ennå. Vi har lyst til å gjøre det, men da må vi ha ordentlig tillatelse. Fordi folk ser ofte veldig annerledes ut når dem er her. De kan se snåle ut og det er ikke sikkert at direktøren eller... Det er ikke sikkert at Statoil-direktøren som er her, eller at en eller annen ned i Uruguay skal se han på knærne med lekebiler og.... (he-he).

Så det er egentlig en ganske stor utfordring i det å formidle ting videre?

- Ja, det er faktisk det.
- Vi syns jo at det er så rikt. At det er så fint og sånn. Og jeg tror ikke det er noe verre enn at man henter inn tillatelse. Men alt kan ikke gå, f.eks ha et webkamera her. Det ville være uetisk.

Lukka distribusjon? At en viss gruppe får tilgang?

- Ja, det er det vi gjør no. At vi brenner en CD og så får bedriften den. Eller sender den bare på mail. Så det gjør vi.
- Men vi har veldig lyst å vise til flere. Så det er bare det med tillatelse egentlig.



Utforming av det fysiske rom vs krav til teknologien?

- Yess! Da snakker jeg ikke bare om Oasen her. Men mange steder som kunne hatt integrert teknologi for å si det sånn da. Med elektronisk pasientjournal senter som jeg tegner nå. Det blir jo bare det vanlige. Men...jeg har personlig ønske, som designer, at det er mest mulig integrert. At sånn som en gedigen smartboard som står på hjul og sånn er litt heftig. Forsåvidt grei siden den kan kjøres vekk da. Det kan den. Men bare for å ta et eksempel med whiteboard – med eller uten teknologi. Så har vi hatt noen oppgaver hvor vi ønsker å få den helt fra gulvet og helt i taket. Altså en del av rommet. Og det er spesielt viktig når det er flerbruks-rom. At man også kan leke kenguru i det rommet. At det bare er en hvit plate der liksom. Som ikke forstyrrer. Eller at det er en skjerm med en gardin foran. At det er noe sånn...at det ikke alltid er det viktigste. For det ser jeg ikke for meg. Jeg er ikke noe sånn teknologi-freak. Og jeg tror retningene jeg har sett foreløpig er at man lager noen rom som er ordentlig sånn flott utstyrt med kanskje en diger skjerm sant. Så du kan sitte på andre siden av jorda og svare. Men så blir det ALT. Så er det DET det er sentrert om, det blir ikke noe annet.

Mister fokus?

- Ja. Så det har jeg ikke villet. Jeg vil at det skal ligge som en mulighet i et rom på lik linje med andre ting. Så...Vi hadde jo tittelen i RIK, som står for Rom, IKT og Kropp. Og egentlig litt sånn intensjonen var at vi skulle utforske dem som likeverdige verktøy. Og det tror jeg er veldig uvanlig. Jeg tror også at sånn... i min tankegang så er rommet et verktøy. Det kan tillate å sitte, å stå eller henge eller å klatre eller å tenke og...skrive eller datamaskin. Det er også IKT og det er kroppen. Mens det er så mange kontorer da som utelukker både kropp og rom. Helt.

Du ønsker dermed å utnytte best mulig de mulighetene som ligger i hver enkelt, og ta bort flest mulig av de begrensningene som ligger i både kropp, rom og teknologi?

- Ja, da må alle jenke seg litt liksom. Da må utforminga av de boksene der (peker på noen bokser)... ja en del av et hele.
- Mer som at alt var lego-klosser. ....(småprat)

Muligheter idag eller fremtidsvisjon?

- Jeg har egentlig ikke kompetanse til å svare.

Men sånn du tror det er da?

- Tror og tror. Jeg tror kanskje at det bare er å få kjøpt inn her og nå. Jeg har noen vibber ute med folk som jobber med grensesnitt og produktdesign, så jeg snapper opp en del. Blant annet ubicomp-ting. Det er så mye spennende innefor kunst og spill og...Jeg tror at det ligger veldig mye der. For det meste av det jeg har snakket om eller tenkt på bunner i noe jeg har sett.

Litt i utforskningsfasen ennå? Kan ikke gå i butikken i få tak i det?

- Ja. Og nei det går ikke det.

.... (småprat)

- Det er noe med det der litt snåle (ubicomp-ting) som er fascinerende. Og det skulle jo vi gjerne hatt her. Faktisk.

## Utfordringer og problemer

Du nevnte det med grensesnitt, at det må være intuitivt.

Hva med sosiale normer og begrensninger? (nevner eksempler)

- At det er sosiale normer som stopper det ja. Jeg tror at alt som er ukjent kan være vanskelig å bruke. Selv om det er veldig veldig lett. Det er det også å snakke om en gråstein liksom (viser steinen på bordet). Det kan jo oppleves rart her. Men jeg er ikke

så redd for den psykologiske eller sosiale redselen. Den kan vi klare så lenge vi er i et rom. Men den teknologiske er jeg mer redd for da fordi den vil være en sånn interferens viss man virkelig skal bruke tid på det. Viss det ikke er poenget. Viss poenget er å få ideer eller å bygge en gruppe, så må det gå så glatt at det ikke blir forstyrrende. Når noen kan det ikke sant og kjøre på, og noen mister helt fotfestet fordi dem ikke kan teknologi eller blir kjemperedd. Får ikke en eneste ide. Så der er det noe som er viktig. Det må ikke være ekskluderende. Det må være kjempelett!

Er noen faser i prosessen bedre egnet enn andre?

- Jeg tror at åpningsfase ikke er så egnet. Absolutt mulig å forsøke, men sånn i en sånn distribuert utgave så hadde det vært spennende å lage en åpning som kanskje klarte å fange opp det vi synes er viktig her. Som er å komme tilstede mentalt, i rommet, i en gruppe. Og det må jo gå an. Sånn virtuelt. Men her, så synes jeg ikke jeg ville ha gått inn på med det første. Spesielt at man skal bli trygge i rommet og kropp og sånn viss vi skal jobbe med et IKT-verktøy senere.
- Men idemyldringsfase er absolutt mulig. Så...åpning og. Når jeg sier åpning så mener jeg ikke den første fasen. Men åpning er litt sånn...da begynner man å se ut i verden på problemer ikke sant.

... (oppklaring av hva åpningsfasen er)

- I åpningsfasen vet man hva problemet er. Man har fått oppgaver og mål, men man er på en måte åpen i hodet. Det mentale.

Prøver å finne ulike veier man kan gå for å komme til målet?

- Ja. Åpner mulighetsrommet.

....

- I idemyldringsfasen produseres det SÅ mye stoff. Som det er så vanskelig å få med helt på slutten. Og det produseres tankestoff/ideestoff for femti bedrifter, og altså sant...Som viss det er bare en dag, og dem skal faktisk velge en ting på slutten. Så er det faktisk et problem at det er for kort tid. Mange ting blir valgt vekk, som egentlig ikke skulle ha vært valgt vekk. Som skulle vært bevart da. Og som kanskje her er bevart ved at man har bygd en eller annen installasjon. Det kan være en sånn måte å gå inn i en sånn åpningsfase på. Man bygger sammen masse objekter, skriver stikkord og... Da er det veldig sånn fri flyt. Så der kunne det (IKT) ha vært brukt. Om det var bare hver enkelt deltaker som skrev eller...

....(kort pause)

- Og så er det noe som heter konseptualisere. Eller velg.

Det er det jeg kanskje tenker på som konkretisere?

- Konkretisere ja. Det kan det også være. Det innebærer både å velge og velge ut. Og så innebærer det ofte en lek med å sette sammen muligheter. ....(utbroderer). Det har jeg også lurt på om det fins et program som kan gjøre det..? For der har vi mye metoder som gjør det. Gule lapper som sorteres, stokkes og bytter ulike farger osv. Og den tror jeg fint kunne ha vært distribuert også....
- Så landing: Der jobber man veldig mye innenfor gruppa. Jobber litt mer skriftlig eller logisk. Eller konkretisering. Det gjør vi jo stort sett alltid. Da ender man opp med å skrive på lange hvite ark. På et eller annet vis. Samle. Forenkle. Spisse. Der er det behov for å skrive. Spesielt. Tegne og få det ned.
- Presentasjon. Det er jo der vi har brukt video før. Og det er nyttig. Foreløpig så er det...er jeg såpass dum at jeg har det liksom ikke inn under huden. Det er ikke så enkelt å gjøre det. Jeg har ennå ikke tatt det ut på maskina liksom.

Det virker nesten som at til lenger ut i prosessen man kommer til enklere er det å ta i bruk IKT-verkøty? I hvert fall med den teknologien som er tilgjengelig nå? Det er mer konkret, det er mer prosedyre- og metodebelagt enn de frie fasene i begynnelsen?

- Ja

Noen problemer her i Oasen? Du nevnte tillatelse til å distribuere informasjon.

- Kompliserthet. Tror jeg er den andre store trusselen.

At verktøyene blir for kompliserte?

- Ja. Sånn at de ikke blir brukt rett og slett. Fordi vi har endt opp med å kjøpe oss samme kamera. Og det er jo en sånn tanke..at det er et verktøy. Vi bare tar det og trykke på knappen. At vi kan det. Selv om det ikke er mitt. Vi har lite tid altså. Vi er skikkelig pressa. Så det her prosjektet (IKT og kreativitet) kan selvsagt være en mulighet til å bruke noe tid på å få lært seg noe. Men viss det skal være så vanskelig at to andre prosessledere som kommer inn må bruke ei uke, så...har vi jo ikke mulighet for det. Det kan jo ikke kunden betale for liksom.
- Veit ikke om jeg ser noen andre

Hva med utforming av rom og at teknologien får for mye fokus? Problemer i forhold til den teknologien som er nå?

- Jeg innbiller meg at det kan løses. For enten er det små ting som kan få sin plass i hylla eller i et skap. Eller igjen kanskje veldig store ting. Og da...inne der er det jo knapt plass til en mus til . Men det er jo et større problem vi har nå då. Vi har litt for lite plass, eller vi skal være alt på en gang. Og da er det gjerne at det renner ut i sanda, eller at det ikke blir noe av noe. At det blir rot.

### **Forbedringspotensiale**

Hva ser du kan bli bedre vha IKT? Kvalitet? Resultat? Kommunikasjon? Markedsføring?

- Jeg tror alt det kan bli bedre.
- Jeg tror ....at det gir et sånt positivt signal om at vi også gjør det (bruker teknologi). At vi er litt moderne og oppegående og sånn. Nå er jeg nede på klisje-plan, men ... Fordi vi møter en del holdninger her om at det assosieres med barnehage. At det er litt sånn for sanselig, for rart. Sånn at det å ha klart å knytte den litt mer teknologiske verden med den veldig barnlige. Viss vi hadde klart det da, så hadde det vært veldig spennende.... Noe med tillit til oss. Det kan være en innbilning fra min side.

At dere kanskje virker mer seriøse?

- Ja
- Og det er veldig viktig for meg å fortsette med den barnehage, sanselige, den mursteinen og sånn. Den er kjempeviktig! Som det ikke er mulig å utkonkurrere med IKT.
- Men viss de kunne stå sammen, så hadde jo det vært fantastisk!
- Og så det med å ta vare på ting tror jeg hadde vært kjempelurt. Både for kundene og for kvaliteten på det vi leverer. Og også for oss selv. Videre forskning. Kjenne at det blir mer ut av ting. .... (om billedprosessrapporter som de lager nå). Vi bruker dem ganske mye. Vi bruker kjøreplanene mye. Om vi ikke gjenbraker mye, så prøver vi ialle fall å lære mye av rapportene og det vi lager. Vi lager det ikke bare for kunden. Og foredrag og forespørslar. Så det kunne ha høynet det nivået masse.

Litt internt læringsmateriale?

- Ja.
- Og et fundament basis for å forske på det.
- Og viss vi skulle dra ut på en konferanse eller skrive en artikkel er heller ikke så lett. Har gjort det faktisk. Vi fikk aldri presentert det, men den ble skrevet. Det er ikke så lett å beskrive (Oasen), det blir liksom litt rart.

.... (småprat, metafor hvor Oasen sammenlignes med vin – like vanskelig å beskrive begge deler, veldig ullent – dersom man ikke har opplevd det så skjønner man ingenting).

## 15.3 Process plan SINTEF-process

# NYTT PÅ NYTT - eller hvordan oppstår idéer? WORKSHOP på Oasen 2. mars 2004

### Oasen inviterer til kreativ workshop

Hvor oppstår liv?  
Hvor oppstår idéer?  
- Og hvordan praktisere dem?

En workshop om det å skape idéer og rom for kreativitet. Om det å gjøre noe helt annet for å gjøre det du egentlig skal. Om enhet i helhet. Og det å være skapende i egen hverdag. Du skal selv bidra til prosessen. Ja faktisk er prosessen viktigst.

Vi vil ha medspillere som kan tenke radikalt, raskt og godt sammen. I gode idéer, samhandling og nettverk kan det ligge et stort potensiale for individet, gruppa og organisasjonen.

I workshop'en tar vi i bruk ulike metoder for kreativ praksis og idéutvikling, og i etterkant vil du få metodebeskrivelser og dokumentasjon på det du har vært med på.

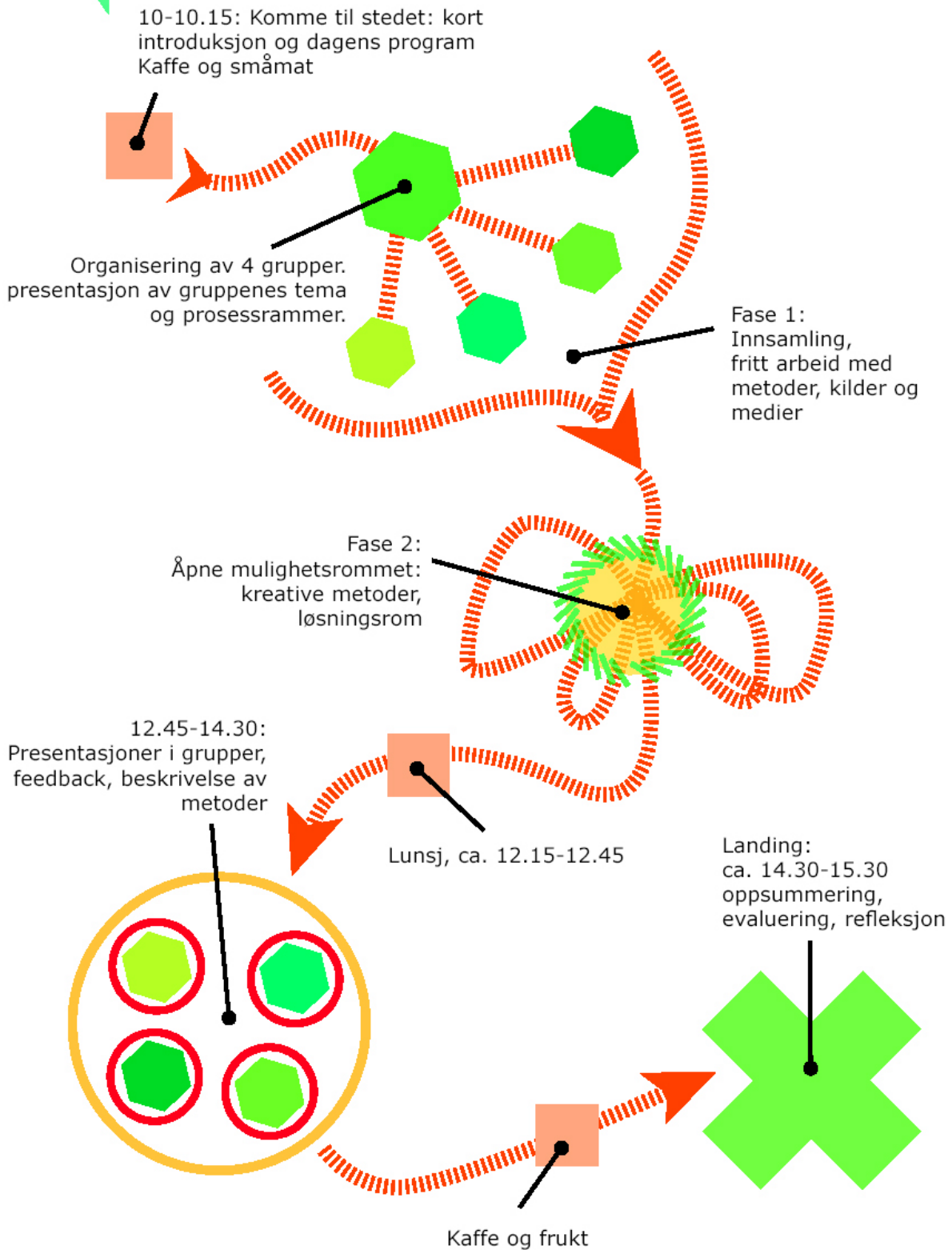
#### **Prosessens hovedmål er:**

- å skape idéer for nye prosjekter
- å finne løsninger for nye organisasjoner
- å avdekke behov hos nye markeder

Til slutt skal vi reflektere og evaluere det som har skjedd og oppstått underveis i de kreative prosessene. Vi vil synliggjøre metoder og knytte broer inn i hverdagsliv og daglig praksis. Kreativitet er en ressurs i hverdagen, ikke pene vendinger i festtaler og strategiplaner.

**Velkommen.**

# Prosessløype





## Idegenerering. Hensikt med målsetting. Del 2

TID	Hva/ Hvordan. Planned learning outcome Activity	Material/ Handouts	Hvorfor /refleksjon	Fasilitator
11.40	Oppvikker/Energizer. To og to sammen	Lang tynn pinne	Reflektere på ledelse	Gunnleif
11.50	En leder den andre hver sin omgang. 3 min hver.			
10min	Ide generering: Goals. Hvorfor er det viktig å ha et mål?	Alle får utlevert en tekst Se vedlegg.	Stimulere fantasien. Reflektere om mål på ulike kontekster	Thang og (Gunnleif)
5min	5 ulike roller til hver gruppe.	Et stort ark/poster til hver gruppe.		
5min	Jobber individuelt med å finne så mange argument som mulig.	Kategoriser		
12.10	Kategoriser ideene/argumentene på arket	Del inn et område på veggen til hver gruppe.		
10min	Henges opp på veggen			
Pause.	Share and take/ ”Dele og stjele”. Besøker andre gruppers poster og noterer seg argumenter			
12.20	Energizer. Hoppe hinke, henge med arm		Refleksjon i plenum? Hva skjedde? Hvordan reagerte du på dette?	Gunnleif
15min	Holder på i max 15min.			
10min	Refleksjon			
12.45	Konkretisering De Bonos hatter	Hatter? Utlevert instruksjoner.(Vedlegg)	Flere kreative innspill	Thang
5min	Deltager i gruppen velger hatt.			
12min	Kritiserer alle lappene de har. Får 2min hver.			
13.00	Dialog rom til å ferdigstille 5 beste punkter.			
13.10				
13.30	Plenumspresentasjon? 4min hver			
	Slutt.			

## 15.5 Process plan IVO 1

# IVO

# fase1

IKT-Verktøy i Oasen

**tor**s  
**03.06.04**  
9:00 - 12:00

**SANKE - UTFORSKE - DELE - SKAPE SAMMEN**

Daglig omgir vi oss med digitale hjelpemidler. Vi snakker i mobiltelefoner, sjekker mail på laptopen, kobler oss på det trådløse nettet osv.

Hva slags digitale verktøy kan Oasen idélab ta i bruk?

Hva slags innvirkninger vil digitale hjelpemidler ha på prosessledere og de som tar i bruk hjelpemidlene?

**Mål:**

- teste ut PDA og SMARTBOARD for å se om disse kan brukes i kreative prosesser i Oasen.
- hvordan skal disse eventuelt brukes

NTNUs idélaboratorium | oasen

**Internprosjekt**



# IVO fase1

IKT-Verktøy i Oasen

## FASE 1; IVO - en arbeidsmetodisk innfallsvinkel

### 09:00 Hensikten og intensjoner med IVO

Mål for dagen ved Thang og Ole. Thang presenterer IVO som Oasen's interprosjekt. Ole forteller om sin innfallsvinkel til masteroppgave.

### 09.20 Komme til stede og bli-kjent øvelse

**Metode:** Visuell morning paper på PDA.

**Beskrivelse av øvelsen:**

Hver person får utdelt en PDA hver. To-og-to personer går sammen. Prosessledere fra Oasen fordeler seg slik at disse ikke kommer sammen i tospann. Deltagere blir bedt om å la pennen løpe over PDAen og tegne det "magen" ønsker å si. Deltagerne tegner alene i tre til fire minutter ut fra temaet: forventninger til prosessen. Stemningen kan bli litt anstrengt i starten av denne metoden fordi mange har problemer med å "komme på noe lurt" på egenhånd. Men si gjeme at det ikke er farlig å stå å stange litt, kreativitet er ikke bare en dans på roser... Når deltakerne er ferdig med tegningen på PDAen; beames gjennom

1. blåtann og vises frem på et lerret gjennom en projektor
2. IR mellom de to avtalte partiene

**Utstyr:** PDA, projektor, pc med blåtann-dongle.

### 09:40 Utforske, dele, skape sammen med utgangspunkt i SmartBoard.

**Metode:** Digital askeladd

**Formål:** Kreativ døråpner i en undersøkelsesfase, ved "stopp" og i idégenereringsprosesser.

**Beskrivelse av øvelsen:**

Parhestene som skal jobbe sammen går bort til et av SmartBoardene slik at halvparten står ved det lille, og halvparten står ved det store SmartBoardet. Med den trådløse musa kan deltakerne bla seg gjennom ulike bilder. Det bildet deltakerne fascineres, provoseres, engasjeres, blir betatt av osv. Stoppes blainga og vedkommende noterer stikkordmessig hvorfor bildet var så fengslende. Når vedkommende er ferdig med stikkordene fortsetter blainga til den andre deltakeren finner "sitt" bilde.

Når deltakerne har funnet sitt bilde, eller bilder hvis det er flere som fenger, lagres bildene på datamaskinen.

**Utstyr:** SmartBoard, projektor



# IVO fase1.

IKT-Verktøy i Oasen

## FASE 2; Utfoldsrommet

10:10 Blomstring av idéer og muligheter

### Formål:

Gener idéer utifrå gitte behov og problemstillinger som oppstår i et scenario

**Metode:** Scenario – idéutvikling

### Beskrivelse av øvelsen:

Scenarioet for deltakerne er som følger:

Til deres neste prosess dere skal ta i bruk de to verktøyene dere har brukt i dag; PDA og SmartBoard. Oppdragsgiveren er Kaospilotene i Danmark og deres kjennskap til IKT er blandet. Dere har å gjøre med alt fra nerden som kan alt om duppedingser til den keitete personen som tror PDA er østerrikes hemmelige politistyrke.

Ta i bruk SmartBoardet og tegn og skriv i fellesskap hvordan dere vil ta i bruk disse verktøyene; PDA og SmartBoard, i deres neste kreative prosess.

Hver idé skal navnssettes og lagres før dere skaper en ny idé.

## Fase 3; Konkretisering

11.00 Deling og sementering av de ulike idéene som generes.

**Metode:** Talking-stick

### Beskrivelse av øvelsen:

Prosessleder styrer tiden, hvert teammedlem får to minutter (man kan bestemme et annet fidsintervall) til å presentere idéen og bygge videre på det som er sagt tidligere. Runden går mot høyre og kan gå så mange ganger man føler er hensiktsmessig. Den som snakker har en talepinne i hånden, denne personen er den eneste som får snakke. Hvis den som har tiden ikke har noe mer å si etter ett minutt, blir det stille, dette er ikke farlig. Ingen replikker, ingen diskusjoner, bare innlegg som bygger på hverandre, tar nye sidespor og driver læringen fremover.

**Metode:** Scoringsmatrise

### Beskrivelse av metoden:

Navnene på de ulike idéene føres på et stort hvitt ark. Det lages en tabell med navnene på de ulike idéene, og navnene på de ulike deltakerne. Helt ytterst føres det på en totalsum hvor totalsummen hver idé har fått skal føres inn.

Hver person kan tildele 10 poeng til hver idé slik at hver idé kan få maks 40 poeng, tilsvarende  $X * 10$  poeng, der X er antall deltakere.

## Fase 4; Evaluering

**Metode:** Hvem og Ønske-Hvem

### Beskrive av metoden:

Temaet for arbeidet presenteres. Temaet her er fortrolighet, trygghet på verktøyene. Deltakerne skal kartlegge hvor stor trygghet de ulike har til de ulike verktøyene.

Temaet plasseres i sentrum av et stort ark. Aktørene visualiseres ved hjelp av sirkler. Metoden varierer etter to dimensjoner:

- A) størrelsen på sirklene = grad av innflytelse
- B) nærhet til sentrum = hvor sentrale de er

## 15.6 Survey questions IVO2

### Del 1 – Nokia Digital Pen – generell bruk

1. Hvordan var Nokia Digital Pen i bruk? (stikkord: pennens vekt, evne til å redigere digitalt, evne til å overføre til pc og mobil, avspillingsevnen)
2. Var det nok veiledning før man skulle ta verktøyet i bruk eller burde det vært gitt mer instruksjon?
3. Var det noen positive sider ved digital pennen, i så fall hvilke?
4. Var det noen negative sider ved digital pennen, i så fall hvilke?
5. I hvilke andre sammenhenger kunne du hatt nytte av å bruke digital pennen?

### Del 2 – Nokia Digital Pen – planlegging av en prosess

1. hvordan var det å planlegge en kreativ prosess med digital pennen?
2. falt det naturlig å bruke digital pennen I planleggingen av den creative prosess, eller var det mer til hindring? Ev. Hvorfor var det naturlig? Hvorfor var det en hindring?
3. Tror du at dere ble mer kreative ved å bruke dette verktøyet? Hvorfor?
4. Hvordan kan digital pennen med på å forankre de idéene som skapes der og da, og sikre at de idéene lever videre?
5. Hvorfor?
6. Noen andre kommentarer du har til pennen?

## 15.7 Part of process plan IVO2

tid	hva	intensjon
09.15	<b>Velkommen og mål for prosjektet.</b>	Mål for prosjektet: hvor (i hvilken fase) og hvordan (hvilken metode, hvilke instruksjoner) skal ikt-verktøyene brukes i en kreativ prosess
09.20	<b>Askeladden som en innledning og presentasjonsøvelse</b> Det er viktig å ta bilder underveis hele tiden, og overføre de over til pc'en.	en enkel oppvarmingsøvelse for å få menneskene i gang, før man kaster de ut i det.
09.40	<b>Nokia Digital Pen.</b> Introduksjon og enkel demonstrasjon av pennen. To og to jobber sammen med hver sin penn og tester muligheter og begrensninger ved bruk av pennen.	Uformell utforskning rundt pennen. Kjenne på hvordan den er i bruk, og hva slags begrensninger som ligger i den.
10.20	<b>Pause</b>	
10.30 – 11.30	<b>Planlegge en prosess med Digital pen</b> Gruppen på fire er et prosesslederteam fra idélaben. De har fått i oppdrag fra Pepsi å se på hvordan man skal markedsføre deres nye produkt Mountain Dew. Dere er hyret inn for å få Pepsi apparatet (de ulike avdelingene) til å komme opp med en ny strategi for å markedsføre Mountain Dew. Eneste krav er at Nokia Digital Pen skal brukes under den kreative prosessen med Pepsi.  10 min presentasjon av den planen de har laget.	I hvilke faser kan pennen brukes?  Hvordan kan pennen brukes i planleggingen av kundens markedsføringsstrategi?  (Hvilke metoder kan pennen brukes sammen med?)
.....	.....	
14.00 - 15.00	<b>Retrospeksjon</b> Alle svarer på de forhåndslagde spørsmålene. Deretter blir det en felles refleksjons/diskusjonsrunde.	Alle skriver en halvtime utifra de spørsmålene som er laget. Deretter settes det av en halvtime til felles diskusjon av bruken av disse to verktøyene.

